THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXV. No. 1657.] LONDON, FEBRUARY 12, 1895. [47TH YEAR. PRICE 6d.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works
(also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

WOLSTON'S TORBAY PAINTS
Special Quotations to Gas Companies.
DARTMOUTH, DEVON.

Lanemark Coal Co.,
LIMITED.
LANEMARK CANNEL AND GAS COALS.
Quotations and Analysis on Application to
LANEMARK COLLIERY,
NEW CUMNOCK, N.B.
Shipping Ports: All the principal Scotch Ports.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.

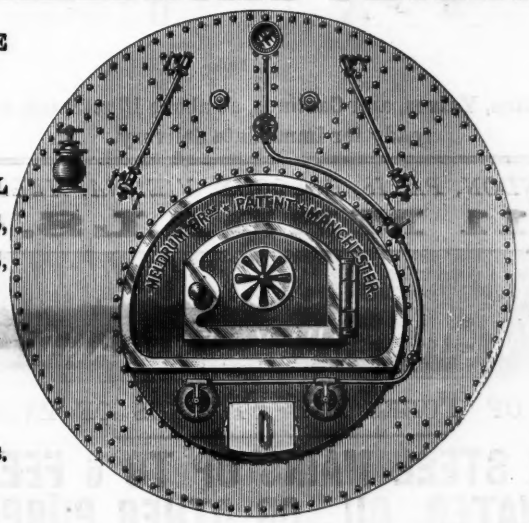
ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

NORTON'S PATENT
"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.
The following Town Water-Works Supplies have been obtained by this System, viz.:—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.
LE GRAND & SUTCLIFF,
HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

DUST-FUEL FURNACE
(MELDRUM'S PATENT).

BURNS ANY KIND OF WASTE FUEL TO ADVANTAGE.

SUPPLIED to the PRINCIPAL GAS-WORKS, WATER-WORKS, ELECTRIC LIGHT STATIONS, &c., &c.



OVER
2300
WORKING.

LONDON OFFICE:
16, UNION COURT,
OLD BROAD STREET, E.C.
WILLIAM BOBY, Agent.

MELDRUM BROS., ATLANTIC WORKS, 13, CITY ROAD, **MANCHESTER.**
Telegrams: "MELDRUM, MANCHESTER." National Telephone No. 1674.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765),

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

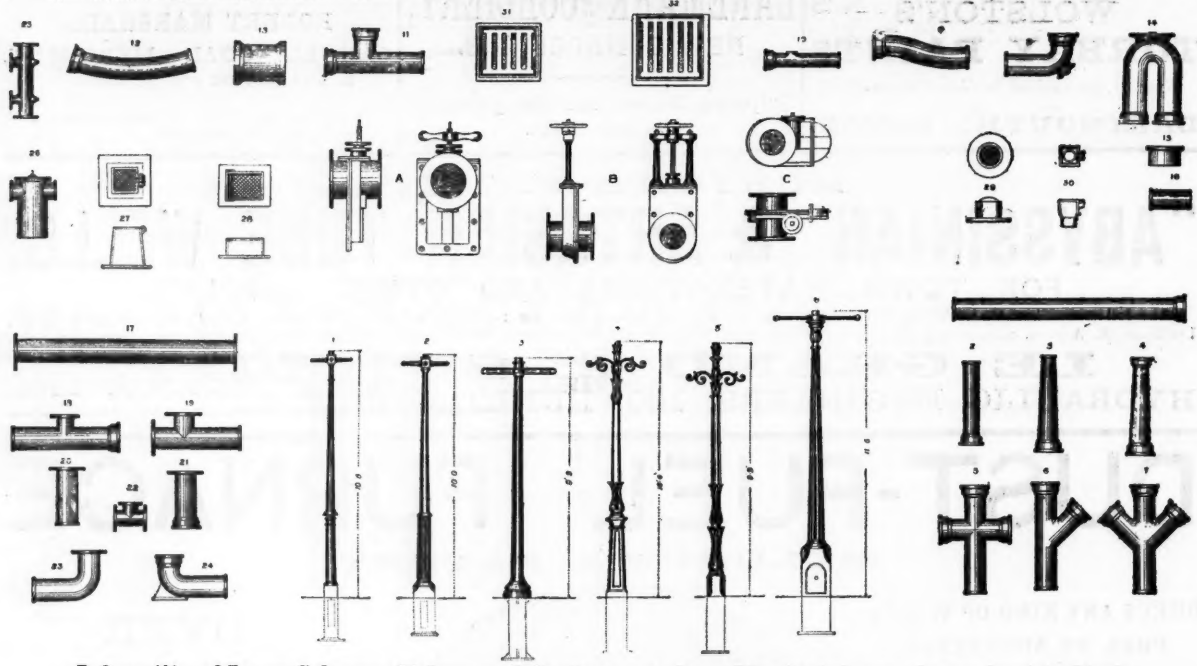
Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

EDWARD COCKEY & SONS, Ltd.,

GAS ENGINEERS, CONTRACTORS, IRON & BRASS FOUNDERS, &c.,

FROME, SOMERSET.



A Quantity of Lamp Columns, Valves, and Castings, as above Illustrated, are always kept in Stock ready for immediate delivery.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—

MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 108, Southwark Street.

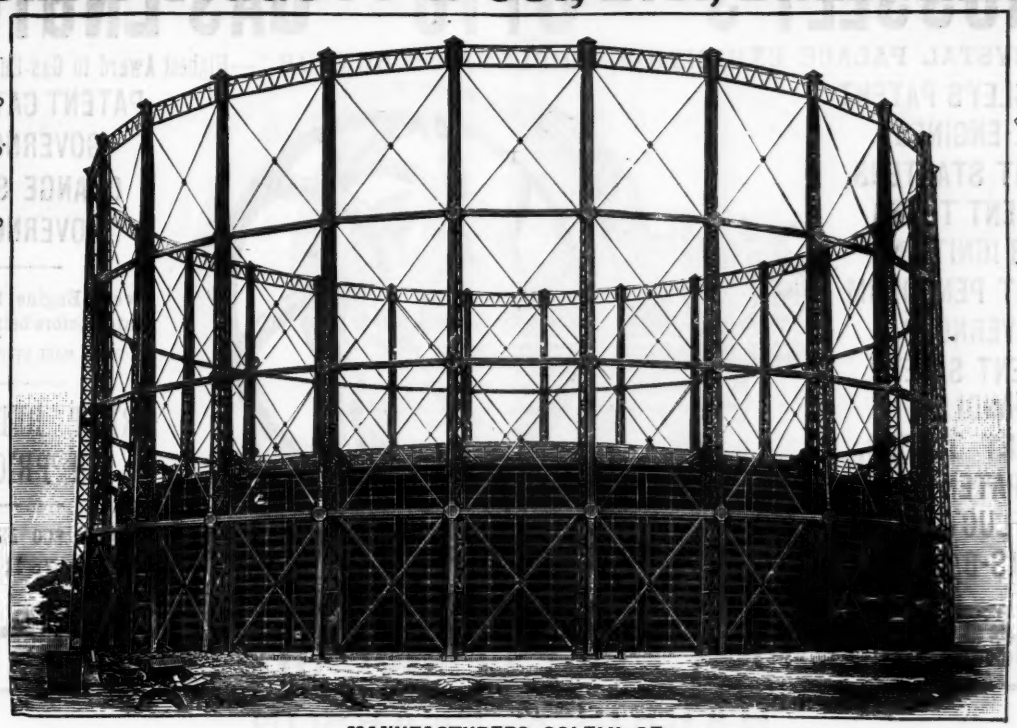
BIRMINGHAM: 114, Colmore Row.

LEEDS: 6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT-FITTINGS ETC.



TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED PIPES, FOUL MAINS, RETORT-LIDS, WROT & CAST TANKS, PURIFIERS.

MANUFACTURERS SOLELY OF

HUMPHREYS & GLASGOW'S PATENT CARBURETTED WATER-GAS PLANT.

— HAS ALREADY BEEN SUPPLIED TO GAS-WORKS AT —

COPENHAGEN, BRUSSELS, GLASGOW, BELFAST, LIVERPOOL, TOTTENHAM, and is in course of Erection now at BELFAST (Second Contract), SWANSEA, & BRIGHTON.

Inquiries to be sent to the Patentees: 9, VICTORIA STREET, LONDON, S.W.

GAS COAL.

BEST

REAL OLD SILKSTONE GAS COAL,

Address THE STRAFFORD COLLIERIES COMPANY,

Near BARNSLEY, SOUTH YORKSHIRE.

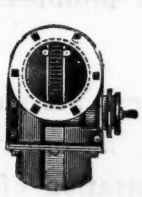
NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES,
WITH RACK & PINION
OR
Internal or External
SCREWS of all sizes.

GASHOLDERS,
AND
Gasholder Tanks.



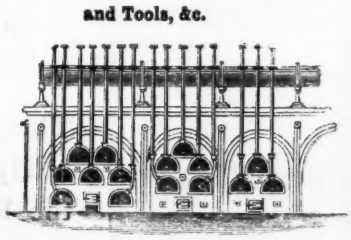
CAST-IRON RETORTS,

RETORT-BED FITTINGS,

And Retort-House Appliances

of every description,

Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.



WROUGHT AND CAST IRON

CONDENSERS,

SCRUBBERS, & WASHERS,

TAR AND LIQUOR PUMPS, &c.

PATENT

CENTRE-VALVES

for working Purifiers,

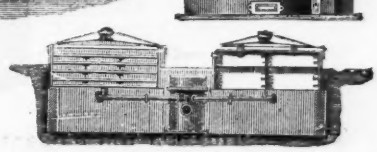
Also Bye-Pass & Stop Valves.

PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS.

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

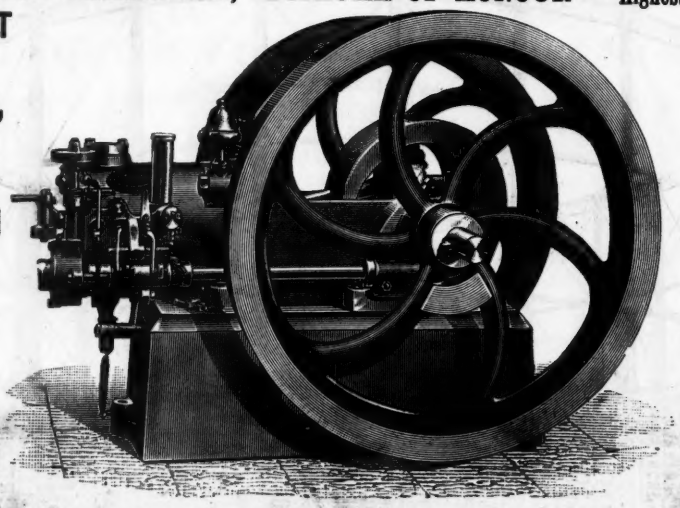
Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

CRYSTAL PALACE EXHIBITION, "DIPLOMA OF HONOUR"—Highest Award to Gas-Engines.

CROSSLEY'S PATENT OIL-ENGINES, PATENT STARTERS, PATENT TUBES FOR IGNITION, PATENT PENDULUM GOVERNORS, PATENT SAFETY HANDLES, PATENT TIMERS, PATENT ANTI-FLUCTUATING GAS-BAGS.



PATENT CATARACT GOVERNORS, CHANGE SPEED GOVERNORS.

Every Engine thoroughly tested before being sent out

ALL PARTS MADE STRICTLY TO GAUGE

GREAT REDUCTION IN PRICES.

OVER 800 ENGINES ALWAYS IN HAND.

CROSSLEY'S NEW HIGH-SPEED ENGINE FOR DIRECT ELECTRIC LIGHTING.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND,

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

THE CONTINUOUS

UNFAKEABLE.

GUARANTEED FOR FIVE YEARS.

UNBREAKABLE.

ADVANTAGES.

Every part is interchangeable.

Cannot be tampered with.

Cannot be broken by Hand or Coin Pressure.

ADVANTAGES.

Automatic Mechanism can be taken entirely to pieces, without interfering with Meter, in a few minutes.

The Coins are absolutely in accord with the Registration of the Meter.

Full Information will be sent on application to:—

THE AUTOMATIC GAS-METER COMPANY, LTD.,

49, QUEEN VICTORIA ST., LONDON. | 1, UPPER BROOK ST., and 6, ROSAMOND ST. EAST, MANCHESTER. | 5, MERRION STREET, LEEDS.

Telegraphic: "Fortress, Donnington, Salop."

C. & W. WALKER,

Telegraphic: "Fortress, London."

MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

London Office: 10, FINSBURY SQUARE.

PURIFIERS with Planed Joints.

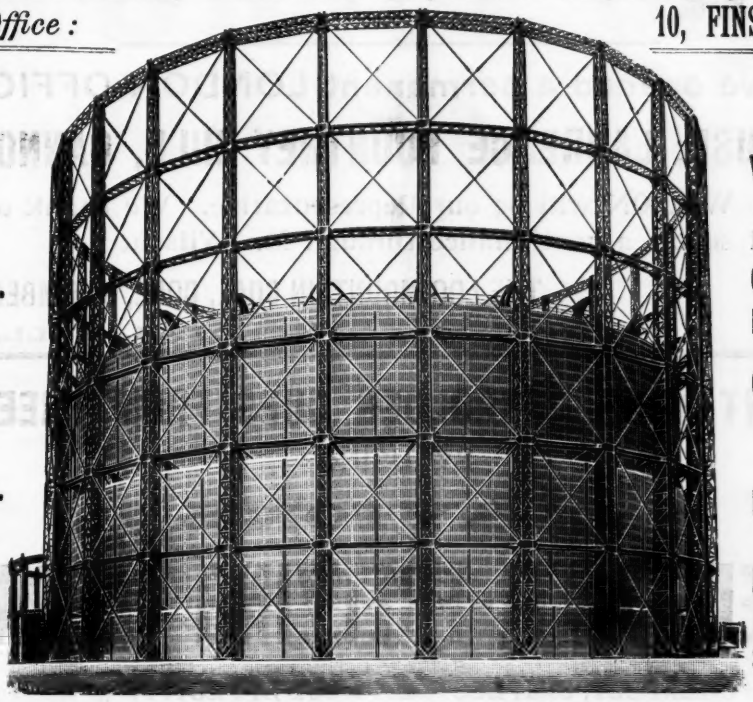
TOWER SCRUBBERS.

WECK'S PATENT CENTRE-VALVE.

CONDENSERS.

TAR PLANT.

SULPHATE OF AMMONIA PLANT.



Eight Million Cubic Feet Gasholder at Beckton, London.

WASHERS.

WASHER-SCRUBBERS.

CLAUS' SULPHUR-RECOVERY PLANT.

CENTRE & FOUR-WAY VALVES.

CRIPPS' HYDRAULIC MAIN VALVE.

RETORT-MOUTHPIECES.

SLIDE-VALVES, TAR-BURNERS, SIEVES.

WALKER'S PATENT PURIFYING-MACHINE.

TO GAS COMPANIES, CORPORATIONS, AND VESTRIES.

IMPROVED STREET LIGHTING

WITHOUT ADDITIONAL COST,

With THREE to FOUR TIMES the ORDINARY LIGHT,

CAN BE OBTAINED BY

THE INCANDESCENT GAS-LIGHT (Welsbach System)

The Inspector of Lighting in Glasgow reports that THE ANNUAL COST OF GAS FOR TEN INCANDESCENT GAS-LAMPS WAS £17, as against £39 with the old system, while obtaining FOUR TIMES THE AMOUNT OF LIGHT. The experiment lasted from May to November, during which time ONLY FOUR MANTLES WERE USED FOR TEN LAMPS.

Send for "Street Lighting" Pamphlet, which gives full particulars, to

THE INCANDESCENT GAS-LIGHT COMPANY LIMITED,

14, PALMER STREET, WESTMINSTER, LONDON.

ANNOUNCEMENT.

BEAR CREEK CANNEL

We have opened a permanent LONDON OFFICE at

SUFFOLK HOUSE, LAURENCE POUNTNEY HILL, CANNON ST., E.C.

Mr. WM. J. WILSON will be our Representative. We thank our friends for past favours, and solicit a continuance through Mr. Wilson.

THE LOG MOUNTAIN COAL, COKE, & TIMBER COMPANY,
F. A. HULL, President.

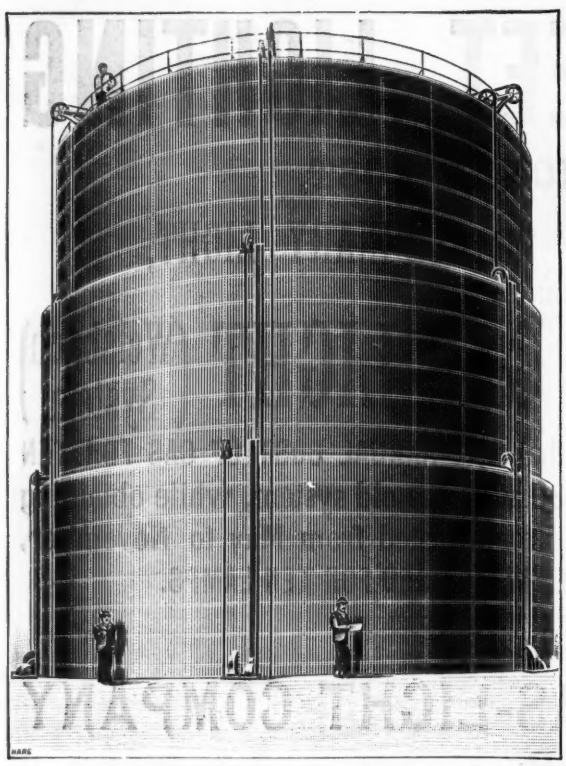
PREVENT YOUR GASHOLDER CUPS FROM FREEZING
BY USING
CLAYTON'S
IMPROVED ANTI-FREEZING APPARATUS

It is the CHEAPEST, SIMPLEST, and MOST EFFECTIVE in the Market.

CLAYTON, SON, & CO., Ltd., Gasholder and Boiler Works, HUNSLET, LEEDS

ASHMORE, BENSON, PEASE, & CO., LIMITED,

GAS-WORKS CONTRACTORS,
STOCKTON-ON-TEES.



From Photo. of Three-Lift Roped Holder, 50 feet diameter by 18 feet deep each Lift. Erected at Sligo, 1894.

Pease's Patent Roped Gasholders

THESE HOLDERS HAVE WORKED SUCCESSFULLY UNDER EVERY TEST TO WHICH THEY HAVE BEEN SUBJECTED SINCE 1889.

MAY BE SEEN AT MANY PLACES.

Send for Catalogue if requiring increased Storage.

The security afforded by this System is shown by the working of the Three-Lift Holder, the subject of this engraving; not only was the Holder unaffected by the recent heavy gales, but also the recorded strain on the Ropes was remarkably small.

London Office: 15, VICTORIA STREET, S.W.

Telegrams {"GASHOLDER, STOCKTON-ON-TEES." "APPARATUS, LONDON."

SEND FOR PRICE LISTS OF

BRAY'S

PATENT FLAT-FLAME LANTERNS,

From 30 to 1100 Candle Power.

THEY ARE SUITABLE FOR GAS OF EVERY CANDLE POWER,

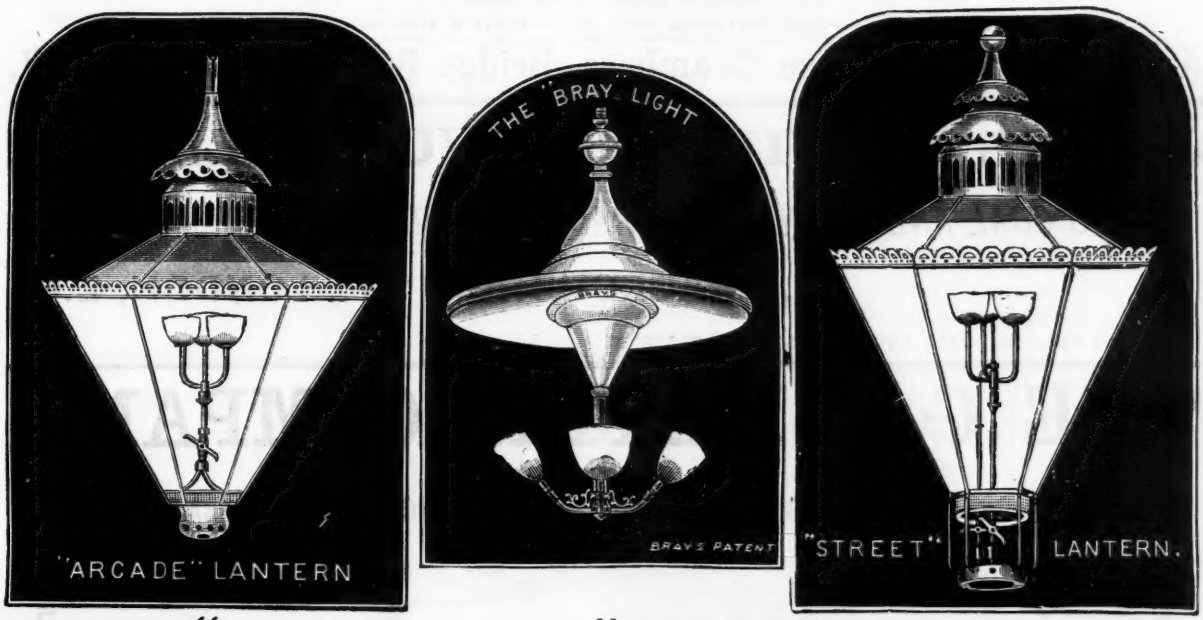
MADE ENTIRELY OF COPPER.

THE "BRAY" REFLECTING LIGHT

Is an unequalled combination of SIMPLICITY, CHEAPNESS, and EFFICIENCY.

GIVES REMARKABLE LIGHTING VALUE FOR GAS CONSUMED.

SEND FOR PRICES AND PARTICULARS.



BRAY'S "SPECIAL" AND "ADJUSTABLE" BURNERS

Are the best in the Market for general use, and are very moderate in price.

It is not unusual to see the ordinary Burner yielding less than half the light that Bray's "Specials" and "Adjustables" would yield with the same consumption of Gas.

Gas Managers should try them on Consumers' Fittings; and they would see at once how to compete more effectively with the Electric Light.

Specially adapted for use with Penny-in-the-Slot Meters, for which purpose large quantities have been sold.

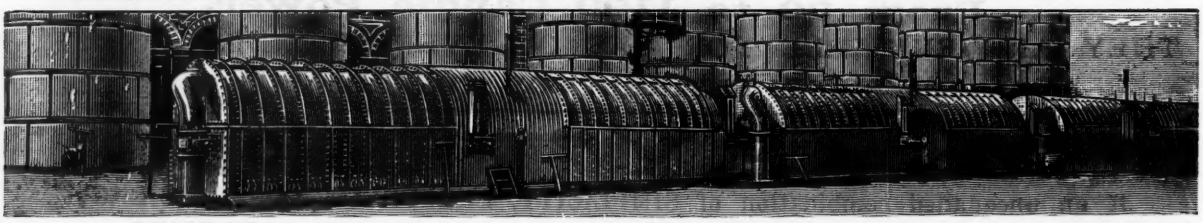
SEND FOR PRICES AND PARTICULARS.

GEO. BRAY & CO., GAS LIGHTING ENGINEERS, LEEDS.

KIRKHAM, HULETT, & CHANDLER, Ld.

PATENT "STANDARD" WASHER-SCRUBBER

☞ **484** of these Machines (capable of dealing with **464,490,000** cubic feet of Gas daily) in use, which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.



View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company have 30 of these Machines in use. They are also in operation at a great number of Gas and other Works in this Country and Abroad.

Sole Agents in Great Britain for Marshall's Patent Tar-Extractor.

Address: 3 & 4, Palace Chambers, Bridge St., Westminster, S.W.

JAMES & WILLIAM WOOD, Limited,

GAS COAL AND CANNEL CONTRACTORS AND EXPORTERS,

57, GRACECHURCH ST., LONDON, E.C.

Registered Office—28, ROYAL EXCHANGE SQUARE, GLASGOW.

THE GAS-METER COMPANY, LIMITED,

MANUFACTURERS OF

WET AND DRY GAS-METERS, STATION METERS, GOVERNORS, GAS APPARATUS, ETC.

SQUARE STATION METERS WITH PLANED JOINTS.

STATION METERS IN CYLINDRICAL CASES.

DESIGN No. 2 PATTERN.

STATION METERS MADE AT THE COMPANY'S WORKS, OLDHAM, Late WEST & GREGSON. Established 1830.

Prices and Particulars apply to

R. L. ANDREWS, General Manager.

Works: 238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

Telegraphic Address: "METER."

[See Advertisement on back of Wrapper.

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON OFFICES & DEPÔTS:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

TELEGRAPHIC ADDRESS:
"ROBUSTNESS, LONDON."

GAS & WATER WORK.

J. & H. ROBUS,

ENGINEERS & CONTRACTORS,
20, BUCKLERSBURY, LONDON, E.C.

Furnish Plans, Estimates, and Specifications for SINKING BOREHOLES *and* WELLS; *erecting* RESERVOIRS, FILTER-BEDS, *and* GASHOLDER TANKS; *and* EVERY REQUISITE *for* GAS *and* WATER WORKS,

INCLUDING

MAIN LAYING

EXCHANGE TELEPHONE 1756.

JOHN BROWN & CO., LTD., SHEFFIELD,
Proprietors of
ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

AN APPARATUS WHICH PERFORMS THE COMBINED DUTIES OF

TAR-EXTRACTOR, WASHER, AND SCRUBBER.

THE "CHARLES HUNT" PATENT WASHER

It requires **NO MOTIVE POWER,** is simple in construction, automatic in action, and readily adjusted to deal efficiently with varying makes of gas. By ensuring minute and frequent subdivision of the gas in its passage through the numerous light liquor seals, the whole of the purification up to the inlet of the purifiers (including the removal of tarry matters) is accomplished in the **ONE VESSEL,** without excessive back pressure—this not exceeding the pressure often accumulated by a small washer working in combination with a scrubber.

The gas enters at the bottom, and passes through a large number of small tubes into a series of light steel troughs, which have finely-perforated edges submerged in liquor, and, escaping through these perforations in minute streams to the next chamber, a similar operation is repeated until the top is reached.

By contact with the strong liquor on the lower trays, the gas is denuded of CO_2 and tarry matters, and in the succeeding trays the removal of the ammonia is completed—the gas passing finally through clean water in the top tray, and thence to the outlet main. The water supply can be exactly regulated to give liquor of a required strength; and the seals can be readily adjusted by means of external regulators to suit the volume and condition of the gas.

SOLE MAKERS:

Westminster Office:
16, GT. GEORGE ST.

S. CUTLER & SONS,

Telephone: 5059.
Telegrams:
"RETORTUS, LONDON."

PROVIDENCE WORKS, MILLWALL, LONDON.

THOMAS GLOVER & CO.'S

PATENT NEW IMPROVED PREPAYMENT METER

Simple in Mechanism.

Positive in Results.

Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC LONDON." Telephone No. 6725.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 62, VICTORIA STREET. *Telegraphic Address: "GOTHIC."*

BIRMINGHAM: 3, BRIDGE ROW, DERITEND. *Telegraphic Address: "GOTHIC."*

LEEDS: BOAR LANE CHAMBERS, 4, BASINGHALL STREET. *Telegraphic Address: "GOTHIC."*

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."*

W. PARKINSON & CO.

PRESSURE RAISERS

For use in Low-Lying Districts, or wherever increased Pressure is required.

For supplying Cooking-Stoves, Gas-Engines, &c.

COTTAGE LANE WORKS, CITY ROAD,

LONDON.

TELEGRAPHIC ADDRESS: "INDEX."

BELL BARN ROAD WORKS,

BIRMINGHAM.

Telegraphic Address: "GAS-METERS."

[See also Advt., p. 348.

CONTENTS.

PAGE

EDITORIAL NOTES:—
GAS, LIGHTING, &c.—
The Chartered Meeting—A Criticism and a Complaint 303
Inquiry under the Notice of Accidents Act 304
Manchester Gas Affairs 304
The Board of Trade on Street Conduit Explosions 304
Judicial Discouragement of Trade Union Tyranny 305
WATER AND SANITARY AFFAIRS—
The Proceedings before the Examiner on the London Water-Works Transfer Bills 305

ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market 306
Electric Lighting Memoranda 306
The Appointment of Workmen-Directors 307
New Unionism Reviewed 307
The Draft Provisional Orders for 1895 308

TECHNICAL RECORD:—
The Incorporated Institution of Gas Engineers—The Annual Meeting 310
Society of Chemical Industry—Mr. L. T. Wright on the Efficiency of Carbon Vapour in Coal Gas and other Hydrocarbon Flames 310
Society of Engineers—Inaugural Address of Mr. W. G. Peirce . 312

REGISTER OF PATENTS:—
Shades and Reflectors for Gas Lamps, &c.—Heron, T. 314
Gas-Joints—Best, R. H. 314
Carburetting Water-Gas—Glasgow, A. G. 315
Heating Attachments for Gas Cooking-Stoves—Guy, J. 316
Gas-Engines—Marks, G. C. (Hirsch, F.) 316
Patent Notices 316

CORRESPONDENCE:—
The Proposed Conversion of South Metropolitan Stock . . 317
The Efficiency of Luminous Combustion 317
The Relative Efficiencies of Acetylene and other Artificial Illuminants 318

PARLIAMENTARY INTELLIGENCE:—
House of Commons—Opening of the Session; Bills to Originate in the Upper House; Public Bills and their Introducers; Gas-Mains and Explosions in Electric Light Culverts 318

LEGAL INTELLIGENCE:—
The Kent Water Company and Troublesome Consumers . . . 318
Ballance *v.* The Belfast Water Commissioners 319

MISCELLANEOUS:—
Meeting of The Gaslight and Coke Company 319
Brentford Gas Company—The Half-Yearly Report and Accounts 322
Ilfracombe Gas Company—The Company's Bill Sanctioned by the Shareholders 322
Provincial Gas and Water Companies 322
The Explosion at the Dalmarnock Gas-Works—Board of Trade Inquiry under the Notice of Accidents Act, 1894 323
The Recent Explosions in Electric Light Street-Boxes—Major Cardew's Reports on the Cannon Street and Euston Road Explosions; The Explosion on Southwark Bridge 324
Manchester Corporation Gas and Electricity Supply—A General Reduction in the Price of Gas; The Abolition of Meter-Rents; The Charge for Electricity 328
Leeds Corporation Gas Supply—The Superintendence of the Department; Purchase of Additional Land 328
The Trial of Oil-Gas Plant at the Bradford Gas-Works—Report on the Experiments with Dr. Dvorkovitz's Process 329
Electric Lighting Notes 330
The Finances of the Liverpool Corporation Water Department . 330
The New Water Reservoir for Lancaster 330
Leicester Corporation Water Supply 331
Notes from Scotland 331
Current Sales of Gas Products 332
Coal Trade Reports 332
Gas and Water Companies' Stock and Share List 334

PARAGRAPHS:—
Death of Mr. G. E. Wood 305
The London County Council and the Water Question 306
Institution of Civil Engineers—Gas-Engines for Dock Pumping—Reports of Gas Associations, 1894—The Quality of London Gas—Improvements in the Yeadon Revolving Retort 309
Ossett Tradesmen's Association and Gas Supply 316
A Claim against the Northampton Corporation Water Department—Gas Consumption in Belfast—Felixstowe District Council and the Gas Company—Sales of Shares 319
The Sandwich Town Council and the Gas Company 323
Death from Gas Poisoning at Huddersfield—A Large Gas Carving-Table and Hot Oven for a Colonial Hotel—The Representation of Workmen and Consumers on the Directorate of Gas Companies 327
The Dublin Corporation Improvement Bill—The Tiverton Corporation and the Gas-Works 331
Bristol Water Company—Stockton Gas Stokers and the Eight-Hour Day—Reductions in Price—Dorchester Gas-Fitting Company, Limited—Gas-Works Extensions at Market Harborough—The Rotherham Corporation and Messrs. Guest and Chrimes—The Liverpool Corporation and the Gas Company—South Wingfield Water Supply—The Hanley Town Council and the British Gaslight Company—New Joint-Stock Companies—Gas-Works Extensions at Workington 333
Midhurst Water Supply—The Public Lighting of Maidstone—Opposition to the London Water Bills—The Price of Gas at Dukinfield 334

TO SUBSCRIBERS.

The JOURNAL is published every Tuesday, price 6d.; by post, 6½d.

TERMS OF SUBSCRIPTION.

One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.

Payable in Advance.

If credit is taken, the charge is 25s. a year.

All communications, remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Post-Office Orders should be made payable at the Chief Office, St. Martin's-le-Grand; Cheques crossed "Union Bank of London."

EDITORIAL NOTES.

The Chartered Meeting—A Criticism and a Complaint.

THE Chartered Meeting on Friday was fairly well attended, notwithstanding the severe weather; and although the proceedings were not enlivened by any special "incident," they turned out to be extremely interesting to all those who have the welfare of the Company at heart. The Governor (Colonel Makins) was in excellent form. He has never spoken better at the Horseferry Road, and rarely so well. This result was due in great measure to his maintenance throughout his address of a high and a welcome seriousness, and a studied moderation of language. The sardonic flippancy which has sadly marred many of the Governor's best-meant speeches in past years was entirely dropped; and the slight acidity of the references to the personages connected with the Rowlands agitation was simply refreshing. As a whole, the address from the chair was distinctly non-irritant, while it never became dull or wandered far from the point. And the Governor's points were many. He replied to the observations that we made last week as to the desirability of confining the capital expenditure of the Company to directly reproductive applications. He trudged manfully, as though he liked them, through swarms of figures; he told how comfortably the Company are getting on with their work-people; and he described the new departure recently taken by the Board in setting up a stove-shop in a prominent situation in Kensington. The subject of rating, coupled with the assessment proposals of the London County Council; the question of meter-rents and their abolition; the promise of another three-quarters per cent. of dividend—these and several other matters were neatly handled by the Governor, who finished his speech with a handsome compliment to Mr. Bryce, the President of the Board of Trade, in regard to his statesmanlike treatment of the Vestries' deputation.

All this was very well, so far as it went; but when the Governor sat down, a shareholder got up, and said some things that put a very different colour upon the aspect of the Company's affairs. Colonel Makins made out that all is for the best in the best of all possible gas companies; and that if certain ill-conditioned people grumble at the high price of the Company's gas, they must be left to "grin and bear it," for the circumstance is solely due to something "inherent" in the Company's system. The Governor had spoken about the state of some of the Company's accounts in 1889; and he was made to go back to the date in a way and for a purpose anything but pleasing to the administration. Capital increased by one-and-a-half millions; reserves depleted by £300,000; selling price of gas raised by 7d. (should not this be 4d.?) per 1000 cubic feet; dividend diminished by 1¾ per cent.; gas sales reduced by 26 million cubic feet—such, in a breath, is one tale of the Company's history for the last five years. It is not a reassuring story; and the Governor's attempt to meet it by remarking that "a good many things have "happened since then" is hardly a convincing rejoinder, for it is a statement that might be interpreted as well against the Chartered administration as for it.

Much has indeed happened during the last five years to other Gas Companies as well as to the Chartered. There has been a gas stokers' strike, but they did not have to deal with it; and what other vicissitudes have been passed through by the Metropolitan gas interest did not come solely upon them. They have to pay £80,000 a year more for labour, it is true. But other Companies are in the same case; and the public are not likely to forget the circumstance—which the Governor omitted to mention—that the Company have benefited not a little by the lapse of the coal dues. Is it too much for the members of the Court to ask themselves seriously what they can show for this additional million-and-a-half of capital expended? Colonel Makins talks about a high price of gas being "inherent" in the Company's system. This is quite true, inasmuch as there are other things which appear to be equally inherent in it—to wit, a steady drain of capital; mismanagement of some commercial affairs of the concern; and blindness of Directors, collectively and individually, to the latter fact. The administration has always been weak, commercially; but things have gone rather worse than usual since about five years ago. The birth of the Gas Workers' Union was said to have been due to dis-

content among the Beckton men. But however this may have been, the Directors of the day promptly lost their heads, and made large contracts for coal on the top of the market. Then came the stupid performance in connection with the South Metropolitan lawsuit, and the assessment litigation, which left the Chartered with an enormous bill for costs, and probably the heaviest rating ever heard of. Chartered trafficking in residuals has long been a byword; but it has now been so cleverly worked as to bring the Company in upwards of 6d. less per ton for sulphate than their southern neighbours make. Meanwhile, the capital and the reserves have been running out like water; and nobody seems to know or care what will be the end of it all. No wonder, then, the price of Chartered gas is "inherently" high. The Governor affects wonder that the Chartered ordinary "A" stock is less favoured in the market than South Metropolitan "B" stock. The comparison and the complaint are his own—we should not have suggested them. But has it never dawned upon him that possibly the world has not quite so much confidence in the business capacity of the Horseferry Road autocracy as he professes to have? Of course, there is no question of comparative security here; both undertakings are safeguarded by the same guarantees. But, fortunately or unfortunately, Acts of Parliament, while competent to protect dividends, cannot manage a business; and people, is a rule, like to see business, be it statutory or otherwise, well and happily managed.

Inquiry under the Notice of Accidents Act.

THE holding of the first official inquiry, under the Notice of Accidents Act, 1894, into the circumstances of an accident in a gas-works, a report of which appears elsewhere, is an event of sufficient novelty and importance to receive some notice. Mr. A. G. Vernon Harcourt was the representative of the Board of Trade on this occasion; and the occurrence in respect of which the Act was put into operation was the explosion in the purifying-houses at the Dalmarnock station of the Glasgow Corporation Gas Department, which happened on Dec. 13 last, when seven men were injured. Evidence was given of the nature of the procedure followed at these works when the purifiers are changed; and it appears to be of the usual order. Water-valves are in use in connection with the purifiers; and lime was the material employed for purification. On this occasion, while the men were shovelling out the lime, and while a layer or two still remained undisturbed on the lowest tiers of grids, a spark must have been struck—it is supposed by one of the steel shovels coming into sharp contact with a stone in the lime—with the result that the residual gaseous mixture that was lying in the bottom of the box exploded. The suggestions that the valves might have been leaking, or that a match was struck, or that the gas caught fire from an exposed light, were all satisfactorily disposed of. The hypothesis assigning the explosion to a spark from a steel shovel and the presence of a residuum of gas in the lowest recesses of the box is altogether a natural and probable one. The moral is obvious, although nobody appears to have mentioned it at the inquiry. It is simply that steel or iron tools are not always safe to use in emptying purifiers, especially when the work has to be done in a hurry, and the presence of gas is possible. Had the old-fashioned maltster's scoops been used for this purpose at Dalmarnock, the accident could hardly have happened in the manner suspected.

Manchester Gas Affairs.

THE Corporation of Manchester have taken what is, in the circumstances, a very bold step in passing, over the heads of their own Gas Committee, a resolution to abolish meter-rents and reduce the price of gas 3d. per 1000 cubic feet all round; thus bringing it down to 2s. 3d. per 1000 cubic feet. The recent history of Manchester gas affairs has been one of agitation and internecine conflict; for the foes of the policy of the Gas Department have been members of the same household. That Manchester gas has been too high priced for many years past, nobody has cared to deny; but the apologists for the policy of the Gas Committee in this regard have always argued that, so long as the ratepayers expected an annual subsidy of £50,000, or thereabouts, out of the surplus profits of the department, the Committee could not help themselves in the matter of the selling price. At last, however, the Committee saw their way to advising the abolition of meter-rents; and they suggested a special reduction in the price of gas consumed for purposes other than lighting. When these recommendations were brought before the City Council, the former was adopted; but instead of accepting the idea of a differential price for gas, the Council, by the large majority of 63 votes to 14, ordered a general reduction of gas by the figure already stated. We have the greatest possible pleasure in congratulating the majority of the Manchester City Council upon their determination. The Chairman of the Gas Committee was strongly opposed to it; in fact, declared that it would mean an addition of 4d. in the pound to the rates. But we hope and believe the worthy, if timid, Alderman was mistaken in this regard. The Corporation are wiser than their Committee; for the stimulating effect of a general reduction of the substantial amount in question will be far greater than anything that could have been expected from the proposed differential price. As to the abolition of meter-rents on the score of their being repellent to consumers, there is doubtless something in this argument. But we agree with the councillor who said that initial charges for fixing a meter and for deposit are a far worse obstacle to the popularization of gas than a small meter-rental. Of course, these initial charges must now be swept away. They are a relic of a barbaric period in gas-works administration, when every new consumer was warded off if possible, and in any case treated as an intending defaulter. If the Manchester Gas Committee really mean business with prepayment meters, all injurious superstitions must be swept out of the department, or they will never catch those 20,000 new consumers whom the Chairman expects to get upon the books. That they can do very well with gas at the reduced price, we have not the smallest doubt—provided, of course, that they manage their affairs reasonably well. This, unfortunately, is not to be taken for granted. But it is never too late for even a Corporation Gas Committee to mend, when they perceive that they will not be supported, as a matter of course, in everything they do or advise.

The Board of Trade on Street Conduit Explosions.

THE subject of the street conduit-box explosions has been mentioned in Parliament, as was to have been expected; and the President of the Board of Trade, in replying to questions by Mr. J. Howard and Mr. J. Rowlands, made a statement respecting the responsibilities of electric lighting and gas companies in this connection. He said that the electric lighting regulations of the Board of Trade for securing the safety of the public provide that all street-boxes shall be efficiently protected against any accumulation of gas or water; and that the Board are earnestly pressing upon the companies the necessity for full compliance with these regulations. He went on to observe that "it "is most desirable that the gas companies should adopt "the best means at their disposal to detect and remedy "any defects in their mains;" and he declared that steps are being taken to call their attention to the matter. These observations are pointed by the reports of Major Cardew upon the City and St. Pancras affairs, both of which are traced to defective electrical arrangements in conjunction with escaped coal gas. It is of the greatest importance for gas companies to look into this subject, and so act as to keep themselves right with the authorities and the public in the new emergency that has been created by the electric lighting distribution arrangements. The Board of Trade make it perfectly clear that the duty of keeping the street conduits clear of gas rests with their owners, the electric lighting undertakers. These things were brought to the gas-mains, which were before them in the streets; but it would be a mistake for gas officials to think that any such consideration absolves them from the necessity for taking further thought of the matter. It is their duty to exercise all due care, skill, and diligence in order to prevent, discover, and repair all defects of their own distributing plant from which gas might escape and get into electric lighting conduits or anywhere else. This is doubtless what they have been in the habit of doing, to the best of their ability; but it is quite conceivable that a standard of work and watchfulness which was good enough in one set of circumstances may need to be raised, now that an alteration has been brought about in the conditions. The tunnelling of the streets for miles by electric lighting conduits is such an alteration of the conditions as would be recognized by

public opinion as constituting sufficient reason for the display of increased vigilance by the gas companies. It is not easy to say what shape this increased vigilance should in all cases take. Whatever may be the prepossession of the official and the public mind on the point, we think it can be fairly claimed for gas companies that they lay their mains and services in a thoroughly staunch manner. The leakage on any of the large trunk mains which convey gas in bulk from one part of London to another is absolutely a zero quantity. It is, however, practically impossible to answer for the tightness of all the smaller district mains, and the services, in roads and under sidewalks which are continually being disturbed for one cause or another, and where sewers, water-pipes, telephone-tubes, telegraph-cable pipes, and lastly, electric light conduits themselves, are so many possible sources of settlements and upheavals well calculated to disturb the integrity of any gas-pipe. Moreover, there is the traffic over the roads, the earth-tremors due to trains, and the complications introduced by the modern impervious road surface coverings which render detected escapes of gas difficult to trace to their origin. We have done all we can do in the matter by drawing attention to Mr. Boverton Redwood's testing apparatus for escaped gas; and if any of our readers has a suggestion to offer in this regard, our columns are at his disposal for such a purpose. The Ansell appliance should not be forgotten. Major Cardew has also done good service in suggesting that voids in street-boxes should be filled up as far as possible. We have confidence in the reflection that if the Board of Trade regulations are more regarded by the electricians than seems to have been the case hitherto, if the conduits and boxes are better ventilated and more frequently inspected, we shall not hear of many more explosions in the streets.

Judicial Discouragement of Trade Union Tyranny.

THE methods of Trade Unionism are getting discouraged by that "old father antic," the law, to a degree that must be very disconcerting to the numerous followers of the new modern profession of labour leader, whose ruling idea of liberty has been that of being able to make other men do as they pleased. Last Friday, a remarkable action was tried by Mr. Justice Kekewich in the Chancery Division, by which Messrs. Trollope and Sons, the well-known master builders, and a number of their employees, sought to restrain the London Building Trades Federation from circulating a list of "blacklegs" headed "Trollope's "Black List." It appeared in evidence that the trouble arose out of the bad feeling that has been shown by the officials and others connected with the Federated Building Trades Unions over the working of the agreement entered into in 1892 by the masters and representatives of the Unions, under which no distinction was to be made between Union and non-Union men. It has been stated that so bad has this feeling now become that there will be yet another strike for "recognition of Union principles" when the period of time for which the agreement was concluded terminates in the spring. Not a sound of any such intention has been uttered officially on behalf of the Federated Unions; but the masters have declared that the Union men have never loyally accepted the terms of the agreement, while, on the other hand, the Union officials have maintained that the masters have given preferential employment to non-Union workmen. In Messrs. Trollope's case, the Secretary of the Federation complained that on two West-end building contracts the foremen were giving the preference to "free" workmen, which was denied. The names of the foremen were mentioned, and a demand made for their dismissal, under threat of all the Union men in the employ of the firm being called out. The firm refused to be intimidated in this way; but the threat was carried out, and 175 men were called off, though a large number still remained. Thereupon a regular strike was instituted; and the different works were closely picketed. Men were taken on in place of those who left; and the works were carried on for many weeks under police protection. Eventually the Federation found out their mistake. The pickets were withdrawn, and many of the strikers applied to return to work; but they were told that their places had been filled up. It is the old story. The Federation, in their spite and chagrin, thereupon had a large number of placards, headed, "Trollope's Black List," printed and distributed to various "lodges" and places of resort frequented by workmen. These posters gave the names of non-Union men employed at the firm's various works, including men who had remained on after the commencement of the strike; and it was this injurious proceeding that the Court of Chancery was invoked to stop. The invocation was completely successful. In giving judgment for the plaintiffs, Mr. Justice Kekewich said that the defendants' principal motive in acting as they had done was to "injure those workmen who were mentioned in "the 'black list,' and also Messrs. Trollope and Sons, "who employed them, and to prevent them from carrying "on their ordinary trade or business with that freedom "which was the privilege of Englishmen." Thus it followed that they ought to be restrained.

WATER AND SANITARY AFFAIRS.

THE extended report of the inquiry into the alleged non-compliance with Standing Orders in respect of the London Water-Works Transfer Bills which appeared in the last two issues of the JOURNAL chronicles nothing more than the "preliminary canter" of the Parliamentary Agents; and the real "tug of war" will come later on. Meanwhile, there are some instructive features in the position that certainly call for comment and criticism. To our thinking, there was considerable force in Mr. Rees's contention that there is no just ground for distinguishing between the position of the London County Council and that of any other promoters of a confiscatory Bill. It is, in truth, an unheard-of proceeding that a man or a company may first be deprived of his or their property, and that it is to be left until later to settle the price for the commodity compulsorily handed over. Why, indeed, should any Water Company be deprived of their right to have the value of their undertaking ascertained and paid before they are ousted from possession? It is certainly a striking point that there was nothing in the statutory notice to lead anyone to suppose that the transfer was to take place on the date which is now specified in the Bills, instead of in the usual manner—*i.e.*, after the purchase-money had been agreed upon or ascertained. True, the London County Council, with the rates behind them, will probably pay, after they are in possession, what they ought to pay before they get possession; but the principle embodied in the Bill is, in our judgment, distinctly objectionable. If such a Bill were promoted by individuals whose solvency might be doubtful, there would unquestionably be great risk and hardship in giving parliamentary sanction to such an unprecedented course. Principle and logic should be observed even where that august body the London County Council is concerned; and we regard it as unfortunate that the Examiner should have thought fit to put the Council in a position which would probably have been refused to individual promoters, or even to a wealthy Corporation.

Mr. Cripps, for the Council, contended that these are Transfer Bills, not Purchase Bills; but it would take a great deal of argument to satisfy any reasonable individual that this is the correct way of looking at the project. Then, too, Mr. Cripps waxed quite pathetic in regard to his opponent's way of stating the magnitude of the proposed transaction. "It has been too much the habit," said Mr. Cripps, "to state that thirty millions or forty millions "will be required to pay for the undertakings of the Com-"panies." He deprecated the reference to such large figures as being calculated to "retard the settlement" of the matter; and yet it would seem that in quoting the probable price the representative of the Companies did not go far in excess of the Council's own figures. Such points, however, have but little substance. The main consideration lies in the fact that there is no precedent to be found for sanctioning transfer before payment; and it would undoubtedly have been better and more just if the notice had been so specific that in this respect the public could not possibly have been deceived. We do not doubt that the Examiner arrived at his decision in good faith; but, in our view, that decision is none the less to be regretted, as giving some colour of official sanction to a new and objectionable innovation in the procedure on Private Bills.

Death of Mr. G. E. Wood.—We regret to record the death of Mr. G. E. Wood, of the firm of Messrs. G. E. Wood and Sons, of the Coal Exchange. Mr. Wood was Chairman of the Walton-on-Thames and Weybridge Gas Company; and a Director of the Hampton Court and Petersfield Gas Companies.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 331.)

THE general disposition of the Stock Markets was dull and flat last week, and business was decidedly quiet, for which the weather was a good deal to blame. Rails were naturally depressed by the unprecedented duration of intense frost. The gilt-edged class have see-sawed according as rumours and probabilities regarding the United States currency question have fluctuated; but they closed at an advance on the opening price. Americans, of course, dropped down; and the only market which really throve was the Foreign. The Money Market is hopeful; but there is nothing yet to point with certainty to any marked improvement. Business in the Gas Market has been pretty active, though limited for the most part to a few of the chief issues. Moderate advances in value have been made by several stocks; and the general tendency is still upward. In Gaslights, the "A" opened very brisk; and, starting at 270, quickly ran up to 274. At that point, however, it received a check, and gradually fell back to the original figure; the nominal quotation being left one point better. Some small business was transacted in the secured issues at nice figures; the 4½ per cent. debenture being very conspicuous in the advance. A fair amount was done in South Metropolitans; and "B" repeatedly changed hands at 300, though two or three special bargains were marked at much lower figures. The report for the half year discloses a large increase in the business; and the accounts show that, with a reduced price, the full statutory dividend has been earned, and a little more. Commercials were quiet and unchanged. In the Suburban and Provincial Companies, there were very few transactions; but prices went up quite merrily. Anything like a 5 per cent. price for good stock is fast vanishing. Among the Continentals, business was very brisk in European and Imperial. The former gained and maintained an advanced position; but the latter, after making a smart improvement, fell back to the starting-point. Malta had a further rise. Of the rest, Sydney and Melbourne bonds and Chicago second bonds rose in price. The Water Companies were quiet in general, and very firm, without any change in quotations.

The daily operations were: The Gas Market opened brightly on Monday; and business was lively at rising prices. Gaslight "A" advanced 1; Imperial Continental, 2; and European, ½. Tuesday was a much quieter day; but prices still advanced. Gaslight "A" improved 2; and Sydney bonds, 1. Activity was fully resumed on Wednesday; values for the most part being unchanged, though Alliance and Dublin issues rose ½ each. Business was fair on Thursday; and several issues improved. Gaslight 4½ per cent. debenture rose 5; South Metropolitan "C," 2½; Brentford old, 2; Alliance and Dublin, ½; and Malta, ¼; but Gaslight "A" fell 2. Quieter business was the rule on Friday. Imperial Continental receded 2; but Melbourne bonds rose 1. Saturday's business was about as usual. British and European advanced ½ each; and Chicago second bonds, 2.

ELECTRIC LIGHTING MEMORANDA.

Major Cardew's Reports on the Explosions in the City and in St. Pancras—Ventilation of Street-Boxes Recommended—A Few Suggestions.

MAJOR CARDEW has reported upon the street conduit explosions in the City and the St. Pancras district; and the principal portions of these documents are given elsewhere. We hasten to state that there is nothing in his conclusions which need alarm either the gas or electric lighting interests, while his opinions with regard to the important question of the prevention of similar occurrences in the future are distinctly reassuring for the public. The Cannon Street explosion was the first in order of time, and it also gave rise to the longest investigation. It is stated by Major Cardew that the system of supply used by the City of London Electric Lighting Company, Limited, consists of a high-pressure alternating current, by means of concentric mains to converting stations, which are, as a rule, underground, and from these a low-pressure supply is given to consumers by distributing mains. The accident on Nov. 10 last need not be again described. The Inspector ascribes it to the breaking down of the insulation of a high-pressure main in the street-box at the corner of Budge Row and Cannon Street leading to the formation of a powerful electric arc between the outer conductor of this main and the end of the iron pipe, forming a conduit for the mains under Budge Row, which projected into this street-box, and the consequent charging of this pipe to a dangerous extent; and the presence of gas in the Electric Lighting Company's pipes and street-boxes, which formed a highly explosive mixture, and was fired by the arc. The breakdown of the main was the consequence of a "careless mistake," whereby an abnormal electrical pressure was brought upon the outer conductor, and found a weak spot where the main was bent to enter the pipe leading from the box. It is unnecessary to follow here Major Cardew's explanation of the character of this blunder on the part of the electricians; and his strictures upon their conduct and methods may be left to benefit those whom they may concern. As to the part played by gas in the affair, Major Cardew holds that there was a good deal of gas about in the neighbourhood, which was a locality where defects in gas-pipes had been rather frequent in consequence of the disturbance of the subsoil by the excavation for the completion of the Inner Circle Railway some time before. The electrical conduits were not ventilated in any way; and, consequently, if gas got into them at any point, an explosive mixture would be formed which an electric arc would ignite. Having regard to the nature and distribution of the explosions, Major Cardew thinks that, as a matter of fact, this is what did happen in Budge Row. He blames the Electric Lighting Company in respect of certain points for "want of judgment, carelessness, and inattention to the Board of Trade regulations."

The question of the accumulation of gas in the conduits and street-boxes is recognized as "the most difficult to deal with of all the questions raised by this accident." The Electric Lighting Company are charged with not having up to the time of the accident displayed sufficient vigour in dealing with this very important matter; but there is some excuse for them in the diversity of opinion as to how gas can be best prevented from accumulating in these conduits. Mr. D. Cook has suggested a plan of ventilation which Mr. Foulger condemns as dangerous; and General Webber thinks that the pipes and conduits should be plugged at each street-box to prevent gas getting into them at all—which would, of course, render ventilation impossible. Major Cardew is of opinion, however, that a system of thorough ventilation of all street-boxes by natural or forced draught should be provided; and, in addition, that everything possible should be done to prevent the entry of the gas by making the sides and bottoms impervious. He also suggests that the air capacity of these boxes should be reduced where practicable, by filling them with incombustible material. At the same time, the system of regular inspection is to be continued, with a view to notifying the Gas Company of all escapes. Major Cardew acknowledges that The Gaslight and Coke Company have taken up a "very reasonable attitude in the matter," and would render all posible assistance in the prevention of similar mishaps for the future. The report is a valuable document to have by one, as it is furnished with several appendices.

With regard to the St. Pancras explosions of Dec. 29, Major Cardew finds that they also were caused by the firing of a mixture of coal gas and air by an electric spark. The gas came, he thinks, from main leaks at one or more points in the vicinity of the electric light conduits, where the soil has been repeatedly disturbed. There is a certain small amount of warmth in these conduits, due to the electric current, which would tend to draw the gas into them. Like the City conduits, those of the St. Pancras Vestry are not at all adapted for getting rid of any gas that may find its way into them; but this is bound to accumulate until a spark sets it off. The system of supply is a low-pressure one; and salt incrustations are apt to form on the insulators of the negative main, which get broken off, with the accompaniment of a small spark. In brief, there is the possibility of the production of an electric gas lighter at every main junction. Major Cardew warns the St. Pancras Vestry that they must ventilate their conduits without delay, and also reduce as far as possible the empty space available for accumulation of gas in their street-boxes. These counsels are particularly wise; but they will cost a good deal in money and trouble to properly carry out.

Let us consider for a moment these recommendations. The packing of spare conduit-tubes could be done by means of ropes made nearly of a size to fit the bore, and either made of asbestos or of fibre steeped in fire-resisting composition. It would be a wrong step to plug the ends where they enter the boxes. The street-boxes could also be packed by means of mats and coils of prepared fibre. As to the ventilation of the latter, this must be effected by the aid of special air-shafts trained against neighbouring house or wall fronts, or standing in line with the kerb; or by adapting the street lamp-posts to the purpose. There is not much real objection to the latter course being taken, provided, of course, that the air-vents are so placed and protected by wire gauze as to prevent any light from getting into contact with the interior. A suitable adjustment of some high with other low ventilators would go far to ensure a proper circulation of air through the conduits. The advantage of adapting the lamp-posts to this purpose would be that there would be nothing novel about the aspect of the arrangement to tempt anyone to tamper with the system.

The London County Council and the Water Question.—A long report from the Water Committee, signed by the Chairman, Mr. Bassett Hopkins, comes before the London County Council to-day, recommending the passing of three resolutions quite adverse to the recent report of the Royal Commission on the Water Supply of the Metropolis. The last resolution thus proposed is as follows: "That the true solution of the problem is the obtaining of the necessary additional supplies from a purer source; and that accordingly the Water Committee be instructed to proceed with the preparation of a scheme to be presented for the consideration of the Council as soon as possible, with a view to an application to Parliament for the necessary powers." Mr. Beachcroft has given notice of an amendment, dealing with the financial aspect of such a scheme as that contemplated in the Committee's report.

THE APPOINTMENT OF WORKMEN-DIRECTORS.

In the December number of the *Forum* (the American magazine devoted to the discussion of subjects connected with political economy), there is an essay by Mr. Louis R. Ehrich which is well worth attention. It is entitled "Stock-Sharing as a Preventive of Labour Troubles;" and it deals with an important development of the idea of profit-sharing, and one, moreover, which recalls the terms of the parliamentary notice for the South Metropolitan Gas Company's Bill. That notice contained reference to a proposal which was before the Directors at the time, but has since been suspended, for obtaining statutory sanction for the appointment of workmen directors. It is a remarkable coincidence that at the same time, but on the other side of the Atlantic, an earnest industrial reformer was actually recommending his remedy for labour troubles of the kind that constitute so troublesome a disease of the body politic of industry in these words: "*Make the employee loyal to the corporation; make him a stockholder, and give him representation on the board of directors.*" The italics are the author's own.

Mr. Ehrich leads up to his suggestion through a well and calmly reasoned explanation of the causes of the discontent of labour with its usual rewards, which he does not fail to point out are nevertheless greater than they ever were in the world's experience. He admits as undeniably true the proposition that the average wage-earner lives in greater comfort, is better housed, better clothed, and better fed, than the richest nobleman of six hundred years ago. He observes also that while in this century capital has had to content itself with a steadily shrinking interest-rate, the return for labour, viewed both in the light of increased wages and of shortened hours, has steadily risen. It must be noted, too, that wages have risen despite the fact that the prices of commodities have greatly fallen. "Yet a deep-seated, turbulent feeling of dissatisfaction prevails among the labouring classes," and is rapidly spreading. He asks whence comes it—how may be explained this strange coupling of increasing physical comfort with increasing discontent (he is speaking always, be it understood, of American labour conditions); and he offers a selection of typical replies to the question. His own answer refers to the difference which was wrought in the relationship existing between employers and employed when the former became organized as a corporation and the small master disappeared to make way for the factory system. "This union of large capital and of business energy, which the corporation effected, has called into life all the great enterprises of our century; but it has also given the death-blow to the old spirit of loyalty which prevailed between employer and employed, and which, in fact, was the spiritual cement that held society together."

Mr. Ehrich then proceeds to discuss the characteristics of an industrial corporation, in the light of a dividend-making machine. It is a far cry from the real employer—the stockholder—to the workman. "The directors, if they have one ear open to the claims of the workmen employed by the company, listen with a hundred ears to the demands of the stockholders whom they represent." Putting the case in its worst, but too often its realized aspect, "the employee of a corporation is under the domination of an employer with whom he never comes in contact, before whom he has no voice, and from whom he can expect no consideration. He is simply a tool worth so many dollars a week so long as he is needed." Well may Mr. Ehrich ask how any feeling of loyalty can develop under such conditions; and he comes to the conclusion that "lack of genuine interest and ultimate antagonism are bound to take root where the tie of employment is a cold balance-sheet on the one hand and an uncertain monthly wage on the other." Then he comes out with his remedial proposal.

His idea, be it observed, does not necessarily imply a preliminary profit-sharing scheme, but starts with the suggestion of a large corporation announcing to the employees that, after a certain date, payment for services would be made at the rate of four-fifths in cash and one-fifth in stock of the company. If this stock were of the ordinary kind, he admits that the average American workman would soon turn it into money. This labour stock should therefore be made non-transferable, and void of value in case of sale or hypothecation. It should, however, be redeemable by the company at par, with a year's grace to avoid the inconvenient results of a general stampede from the service. "The labour stockholders should be allowed to vote for one or more directors to represent them on the board. This representation would obtain for them a hearing before the controlling body, would tend to prevent hastily-considered action as affecting their welfare, and would enable them to receive direct, authentic information concerning the condition of the company." Mr. Ehrich declines to discuss the details of such a scheme. His point is that if the employees of a corporation were made stockholders, sharing in the prosperity and in the adversity of the company, having a voice in its management, and being fully informed as to the condition of the business, a spirit of co-ownership, of close personal interest, of loyalty would be created which would make strikes most improbable, if not impossible. "Every employee would feel that he was, to a degree, working for himself, that improved work would mean increased dividends, and increased value for his stock. His occupation would be invested with a deeper interest, a higher dignity. It would soon be recognized that it has been a waste of economic force to reduce man to the level of a tool." Mr. Ehrich refers to the incident of the recent strike of railway employees in the States; and he argues that if the men had been stockholders their impulse would have been to protect, not to destroy, the property of their respective companies. "One of the commercial agencies estimates that the losses occasioned by the late strike will aggregate 81 millions. One-tenth of that sum held as stock interests by the railroad employees, would have made that strike an impossibility."

To the obvious remark that his scheme is "simply profit-sharing," Mr. Ehrich replies in the affirmative, insisting, however, upon the addition of the features of stockholding and the voice in the management. Profit-sharing, strictly speaking, it is not, as the employees would, in the first place, receive their full fixed pay. He does not claim the profit-sharing element as original, even in connection with railway service; stating that the Paris and Orleans Railway had a system of the kind in operation for many years, which was "extraordinarily successful until undue extensions and Government interference destroyed its usefulness." He does not know of any example of stock-holding in connection with profit-sharing, with the single exception of the *Bon Marché* of Paris; but we have to refer him to the example of the South Metropolitan Gas Company. Such a crown of the system as workmen-directorships does not, however, yet awhile exist; but it is a consummation that cannot be long deferred.

Finally, Mr. Ehrich does not claim to have advanced his proposal on philanthropic grounds. On the contrary, he declares with some boldness that "in this, as in all human actions, the policy of justice and of humanity will eventually be found to correspond and harmonize with cold self-interest. The best that is in men cannot be bought by a fixed money-wage; and it pays to get the best. When railroads and other great corporations take their employees into *quasi*-partnership by making them stockholders, and encourage their dignity and manhood by giving them representation on their directors' board, great strikes will be a thing of the past." And, it may be added, the dry-rot of perfunctory service will be checked, and the workman be saved from himself and from "the foes of his own household"—the professional agitators.

Who is to have the honour and profit of inaugurating this better era? Why should it not be done here in England, and especially by an English gas company? For many reasons, a statutory gas company, with no trade rivals to dread, no trade secrets to keep, offers a fair field for the trial of such an experiment; and if workmen are eligible to serve in Parliament, upon county councils, and on municipal corporation committees, it is idle to pretend that there is any insuperable obstacle in the way of putting them on the board of directors of a gas company. It is probable that the hands of the Chairman of the South Metropolitan Gas Company, who is known to favour the idea, would have been strengthened by Mr. Ehrich's able essay, if its publication had come a little sooner.

NEW UNIONISM REVIEWED.

In the current number of the *Quarterly Review*, is an exposure of "The Methods of the New Trade Unionism." The article is more than a mere recapitulation of the outrages committed by, or in the presumed interest of, members of the New Trade Unions, and more than a record of the wild counsels given to infuriated mobs by men who are now Members of Parliament, County Councillors, Guardians of the Poor, and so forth. It serves the purposes both of a chronicle and a criticism, inasmuch as, together with the record of what has actually been done in the name of Trade Unionism of the "new" variety, it gives a survey of the writings and other influences of the times which have been more or less patently instrumental in rendering such things possible, even inevitable. The reviewer gives his authorities for the literary portion of his matter; and it may be interesting to know what equipment of the kind is presumed to be requisite for forming an opinion upon the subject. Five books are included in the reviewer's list: "Essai sur la Répartition des Richesses," par Paul Leroy-Beaulieu (3me édition; Paris, 1888); "Le Collectivisme—Examen Critique," par Paul Leroy-Beaulieu (3me édition; Paris, 1893); "A History of Trade Unionism," by Sidney and Beatrice Webb (London, 1894); "A Criticism of the Theory of Trades Unions," by T. S. Cree (third edition; Glasgow, 1892); "Trade Unionism—A Criticism and a Warning," by James Birks (West Hartlepool). This is not a long list; but it must occur to the reader that it probably represents far more systematic study than could be credited to most of the turbulent persons whose doings point the moral and adorn the tale of the reviewer. If it is necessary to read five books of what the ordinary frequenters of public free libraries in this country would designate as a "dry" order, before one can understand anything about the true inwardness of the doings of the New Trade Unionists, how many books were required to be read by the doers thereof? The answer is, obviously, none; and it puts in the most glaring light the reason for the men who know all about the why and the wherefore of popular movements not being the leaders of these

manifestations, but being found aloof in libraries and studies whence their belated utterances hardly reach the crowd without. The men who figure in popular commotions do not know; the men who know do not act. And so it comes about that the largest portion of that popular passion which, if only properly directed, might move the world, is spent against immovable obstacles deep-rooted in the scheme of things, but not discovered by the blind zeal of the agitator. "Come, let us make all things new," cries the demagogue; and he helps to create a new variety of Trade Unionism to start with. For a time the new organism seems charged with lusty life, and of a strength to beat down all opposition. Nothing, or hardly anything, stands against it—only a stubborn individual here and there will not bend, only an insignificant old law or two fails to sanction the new movement. What are such obstacles to the freshest of popular frenzy? Will they not be uprooted, swept away, demolished? Nothing of the kind. They stand their ground; and in a very brief period it is seen that while they remain, it is the popular force that has become spent. Then from his old observatory comes the calm remark of the student: "I told you so!" It seems a pity that he could not have been heard before.

The reviewer in the present instance is this dispassionate observer. He did not, apparently, face out the redoubtable 'ohn Burns "in the old days when he was on his promotion." as the article has it, and tell the populace who were being misled by him and others how foolish and unattainable were the ideals of the demagogues. Unhappily, Hyde Park and empty railway arches all over the country see the seed sown which quiet-living reviewers can easily classify, but are powerless to kill. However, we must all do the best we can, and especially do what in us lies to spread the truths of economical science, against which, though demagogues rail and their dupes storm and riot, the powers of ignorance and passion cannot prevail.

The reviewer begins by showing that the present unrestful relations between capital and labour are nothing more than the contemporary phase of the world-old and perennial controversy between the "haves" and the "have-nots." There is in our midst an order of the population which lives from hand to mouth, by force of circumstances or its own fault. This is the "proletariate," as the reviewer spells it; but why he adds the final "e" is not clear. Side by side, and in marked contrast, is to be found a property-owning order, maintaining itself, in part at least, on accumulated wealth, or on the rents and profits derived from a private ownership of land, machinery, and the other instruments of production. The position of a member of this order is obviously superior to that of the other. He has something beyond his labour on which to fall back. The whole problem of modern society is summed up in the question: "Can this proletariate acquire the security and contentment which now belong to the property-owner, by any method other than that which has been followed by the property-owner himself? Is it possible, in the interest of the proletariate, to devise any new tenure of property, which will absolve them from the task of patient, industrious, and self-sacrificing accumulation; or from the anxiety, hardship, and frequent disappointment which too often dog the course of more adventurous and speculative endeavours after riches?"

The New Trade Unionist has a specious "program" for effecting the above purpose, by the way of Collectivism. He has had some vogue with this presciption, which has been none the less popular among the people who have swallowed it, for being in the last degree vague and mysterious. However, a reaction is already setting in; and the first to feel it are the "program" makers, who played such fantastic pranks when dressed in the "little brief authority" of chiefs of a prosperous Trade Union. But how have such men been able to impose, even for a season, upon the "proletariate?" Because, as the reviewer thinks, the members of this order of the population have only of late years learnt to question the right of ownership of private property; and about the same period they acceded to political power. In earlier times, education and political power were the privilege of owners of property. The property-owning classes governed the country. The position of the poorer classes seemed more natural and inevitable; and it was, perhaps on this very account, less irksome. Industry was pursued with less intensity; and more contentment was derived from a humble and subordinate position in life. Circumstances have now changed. Education, "of a kind," has descended to the poor; and the political emancipation of the masses is complete. Wages have risen, the cost of the necessaries of life has fallen, and what were once regarded as luxuries for the wealthy are within the reach of all but the pauper. Yet the discontent of the "proletariate" is more acute. It would appear that we have here another illustration of the law noticed by Herbert Spencer, that when things begin to mend, the louder grows the complaint about their badness.

M. Leroy-Beaulieu establishes the fact that modern civilized life has a tendency to reduce the inequality of its conditions. Unfortunately, this is not the view that the most notorious leaders of working-class opinion find it to their advantage to impress upon their followers. There is a method of emancipation, arduous and uncongenial, open to the labouring man; but he does not need "leaders" in it. Yet it cannot be said that all Trade Union chiefs are time-serving, or all workmen self-indulgent. Mr. Delves could tell delegates at the Norwich Congress they have "more to fear from drinking and gambling than from all the capitalists put together;" and it is unnecessary to go far for records of hardships heroically borne by strikers "for a principle." Why cannot these invaluable qualities of reasonableness and endurance be made to redound directly to the workmen's advantage, instead of being squandered, as they so often are, in futile endeavours to maintain the policy of a Trade Union, which frequently means the ideas and interests of a professional agitator.

The reviewer discusses the substitutes for thrift and self-denial on the part of the "proletariate" which found favour at the Norwich Congress; and he shows that Trade Unionism and State Socialism are the militant arms of the new Utopia which it is designed to rear upon the ruins of the existing order of society. This order is, in the main, a natural organization. It is the result of ages of spontaneous growth, and is not created, and very little influenced, by law. "There is no reason to suppose that, if Government and law were abolished, this natural order of society would be largely, or at all, modified. Historically and philosophically, the State is merely an incidental and minor development of society, for certain administrative purposes." If we are to go on in the old ways, and adhere to the constructive principles of our present civilization, society must continue to satisfy its wants by the automatic movements of its component units, directed by well-understood influences. What is the other system—this Collectivism—which is to take its place? M. Leroy-Beaulieu discusses it, and then leaves the indicated programme "unthinkable" as the reviewer puts it. He thinks that the need of the day is not more refutations of Socialistic fallacies, but "rather popular and convincir g presentation of the true theory of society." In this pronouncement we are disposed to concur.

In considering the place of the New Unionism in the Collectivist policy, the reviewer brings into prominence the important truth that the New Unionist idea has no room for liberty. It depends upon compulsion, and operates through coercion of the many by the few. The career of Mr. J. Havelock Wilson is briefly sketched in illustration of this generalization. A graphic account of the operation of the "strike policy" of a Trade Union follows, spiced with some warm extracts from agitators' speeches upon such occasions. "For the pawns in this unhappy business," says the reviewer, "we have a real sympathy. We have said nothing, and propose to say nothing, of the merits of these disputes. We have yet to learn that the merits of any question will make it advisable for a man to cut off his nose to spite his face." But the professional agitator is careful not to so disfigure his own physiognomy; he leaves this to his dupes. The late Scottish coal miners' abortive strike furnishes the reviewer with his last illustrative material. His general conclusion on the whole matter is that "the advantages of this coercive Trade Unionism are at best small and doubtful; the disadvantages are great and undoubted." Still the men in many instances are faithful to their leaders, who for their part do not know which way to turn in the hopeless search for a safe road to the new Utopia. What is wanted in the emergency is not law, which can keep the peace, but cannot heal "the mind diseased" by revealing to it a vision of the better way. "That is the supreme need of the hour. This realized, men will no longer waste themselves in forced marches after the *ignis fatuus* of an impracticable Collectivism, or seek to exchange the civilized instincts of mutual concession for the primitive and savage instincts of coercion."

THE DRAFT PROVISIONAL ORDERS FOR 1895.

THE following draft Provisional Orders relating to the supply of gas and water have been deposited with the Board of Trade, and will come before Parliament in the usual form during the present session:—

The Barnstaple Gas Order is to amend the Barnstaple Gas Act, 1869. The Company desire additional money powers to the extent of £16,000 of 7 per cent. share capital, to carry the usual proportion of loan capital. Sanction is sought for the creation and issue of debenture stock, with interest limited to 5 per cent. The Bognor Gas Order is to empower the Bognor Gaslight and Coke Company, Limited, to acquire additional lands and erect a new gasholder thereon, and use the same for gas-works purposes generally. The Felixstowe Gas Order is to confer statutory powers upon the Felixstowe Gaslight Company, Limited. The limits of the Order are to be the parishes of Walton, Felixstowe, Trimley St. Mary, and Trimley St. Martin, in Suffolk. The share capital of the Company is put at £20,000, of which £9000 is original capital, with the usual borrowing powers. Additional lands to the extent of three acres are to be acquired. Power is sought for making contracts for the supply of gas in bulk to any local authority beyond the limits. Gas of 15-candle power is to be supplied at the standard price of 5s. 5d. per 1000 feet. Interest at 5 per cent. is to be paid on all consumers' deposits. The Kildwick Parish Gas Order is to empower the Kildwick Parish Gas Company to raise £20,000 of additional share capital, to carry the usual borrowing powers. Sanction is desired for the creation and issue of debenture stock. The Llanberis Gas and Water Order is to confer statutory powers upon the Llanberis Water and Gas Company, Limited. The

Order is divided into four parts, and has 69 clauses. The gas capital is put at £2000, to bear 10 per cent. dividend if issued as ordinary, or 6 per cent. if issued as preference capital, with £1000 of loan capital. Additional lands are to be acquired. Gas of 15-candle power is to be supplied at the standard price of 5s. per 1000 cubic feet. Separate accounts are to be kept in respect of the gas undertaking. Interest at the rate of 5 per cent. is to be payable on consumers' deposits. The water capital is to be £4000, with £2000 by way of loan. The water-works comprise two existing reservoirs in the parish of Llanberis. The proposed new works consist of an intercepting 6-inch pipe commencing in New Pool on the Afongoch stream, which forms one of the sources of supply, and a new channel for the same stream. Rates for water for domestic uses are to be 1s. 6d. in the pound, subject to revision by the Board of Trade after the expiration of ten years from the commencement of the Order, on the requisition of any local authority interested, or of twenty inhabitant householders. Water for public purposes is to be charged for at a rate not exceeding 2s. 6d. per 1000 gallons. Power is sought to supply water in bulk beyond the limits, and to sell by measure within them. Separate accounts of the water undertaking are to be kept. The local authority of the district may acquire the undertaking within twelve months after the expiration of ten years, at a price to be agreed upon or settled by arbitration. The value to be so determined is defined as being the fair market value of the property at the time; due regard being had to the nature and condition of the buildings and plant, and to the circumstance of their being ready for immediate working and suitable for the purposes of the undertaking. The undertaking is not to be assigned to any other purchasers than the local authority, without notice to the latter, who are to have a preferential option of purchase, exercisable within three months. A clause is inserted for the protection of the London and North-Western Railway.

The Newark Gas Order is to empower the Newark Gas Company to raise £24,000 of additional share capital, carrying the usual borrowing powers. It is desired, with the consent of three-fourths of the shareholders, to increase the nominal amount of the capital of the Company, as declared and authorized by their Act of 1866, by the issue of fully paid up capital stock to an amount not exceeding £2800—being the sum expended by the undertakers out of revenue on capital account; and this capital stock is to bear 5 per cent. dividend. The limits of supply are to be extended to include the parishes of Balderton, Barnby, Coddington, Farndon, Hawton, Kilham, South Muskham, Stoke, West Newark, and Winthorpe, all in Nottinghamshire. Permission is sought for the creation and issue of debenture stock. Additional lands are required. Gas of 15-candle power is to be sold at the standard prices of 3s. 6d. per 1000 cubic feet within the municipal borough of Newark, and 4s. per 1000 cubic feet outside. Two hours' previous notice in writing of any intended test of the quality or pressure of the supply is to be given to the undertakers. Power is sought for laying pipes in undedicated roads. Consumers discontinuing to take gas are to be made liable to pay for all gas registered by the meter up to the expiration of 48 hours from giving the written notice. Prepayment for gas may be required in certain cases, subject to the allowance of interest at the rate of 4 per cent. on every sum of 10s. so prepaid. The period of error in defective meters is to be limited to the current quarter. Permission is desired allowing discounts to consumers, provided that all are treated alike; and for the undertakers to apply for electric lighting powers.

The Newton Nottage Water Order is to empower the Porthcawl Water Company, Limited, to maintain and continue water-works, and to supply water in the parish of Newton Nottage, Glamorganshire. The share capital is to be fixed at £11,000, whereof £8000 is original capital, with the usual borrowing powers. The works comprise a well and pumping-station, and filters and softening works and machinery adjoining Porthcawl Gas-Works, together with a water-tower and tanks. The water-rate for domestic supplies is to be 10 per cent. on the rateable value of the premises, with extras. Power is sought to supply water in bulk beyond the limits, and to sell by measure, if agreed, for domestic or any other purposes within the limits. The Mid-Kent Water Order is to confer statutory powers upon the Mid-Kent Water Company, whose capital is to be fixed at £49,500, of which £16,500 is to be raised under this Order, besides the usual borrowing powers. The district of supply is to be enlarged to take in the parish of Aylesford, subject to the condition that if a sufficient supply is not given within six years in any part of the district, the local authority may provide such supply in accordance with the provisions of the Public Health Act, 1875, or any company may apply for an Act or Provisional Order with the same view, "as if there were no company authorized by this Order to supply water therein." The works, situated in the parish of Halling, consist of a pumping-station and service reservoir. Another service reservoir is to be authorized by the Order. A clause is inserted for the protection of the county roads and bridges.

The Rothwell Gas Order is to empower the Rothwell Gas-light Company to extend their limits of supply to include a defined district in the neighbourhood of the township of the same name, in Yorkshire. Additional gas lands are to be acquired. The Holyhead Water Order is to empower the Holyhead Water-Works Company to raise £9000 of additional capital, and to borrow £1500. Power is sought for the creation and issue of debenture stock. Additional lands are to be acquired; the total holding of the undertakers being limited to 10 acres. A new reservoir is to be constructed, having an area of 2¼ acres, contiguous to the existing reservoir, to be situated in the parish of Holyhead, in the county of Anglesey. The South Hayling Water-Works Order is to confer statutory powers upon two private undertakers of water supply for the parish of South Hayling (Hayling Island), Hampshire. The capital is to be £5000, with £1000 of borrowed money. Lands are to be acquired and works constructed, comprising three wells and pumping-stations in South Hayling parish, with the accessory works. The supply need not be constantly laid on under pressure; but an order to this effect may be made at any time by the Board of Trade, which must be carried into effect within three months. The rate for domestic supplies is to be 8 per cent.; provided that the undertakers shall not be compelled to afford a supply of water for domestic use for less than six months, nor in any case for a lower sum than 5s. in any one year. Water is to be suppliable in bulk beyond the limits, and also generally by meter. At any time after the commencement of the Order, the undertaking may be sold to an interested local authority.

Institution of Civil Engineers.—At the monthly ballot for membership of this Institution last Tuesday, Mr. J. M'Kean Rowbotham was elected an associate member.

Gas-Engines for Dock Pumping.—We learn from the *Engineer* that, in addition to the pumps mentioned in the JOURNAL for the 8th ult. (p. 71), the River Wear Commissioners have placed an order with Tangyes Limited, of Birmingham, for the pumping machinery for their No. 1 Dock. It is to consist of two 40 nominal horse power gas-engines, arranged to work with town's gas, each driving a 22-inch centrifugal pump with 66-inch disc; each pump and engine being self-contained on one base-plate. The pumps are to deliver 19,700 gallons per minute from the dock, the maximum height of lift being 24 feet. A small drainage pump, driven by a belt from a gas-engine, is also to be fitted in the dock. The whole of this machinery is being designed by the above-named firm (under the instruction of Mr. H. H. Wake, the Engineer to the Commissioners), and will be manufactured by themselves.

Reports of Gas Associations, 1894.—As will be seen by the announcement which appears in our advertising columns, the volume of reports of proceedings of the various District Associations of Gas Managers during the past year is now ready. This being the twelfth year of publication, many of our readers are perfectly familiar with the work, which, it may be mentioned, was originally projected, in compliance with expressed wishes, with the view of preserving in a collected form, convenient for reference, the papers and discussions at the meetings of the smaller organizations of gas engineers and managers. The contents of the present volume do not call for remark. The technical matter, which is illustrated by fifteen diagrams and two folding plates, occupies 387 pages; and it is accompanied by lists of the members of the several Associations, and a general index. The appearance of the book is the same as in previous years.

The Quality of London Gas.—The weekly returns made to the London County Council by their Chemist and Superintending Gas Examiner (Mr. W. J. Dibdin, F.I.C., F.C.S.) have lately presented an extraordinary record of deficiency in the illuminating power of the gas supplied to the Metropolis. In the week ending the 2nd inst., the gas was reported by him as being below the standard on no less than thirteen occasions; in the previous week, on nine; while in the first three weeks of the year, there was a deficiency on two occasions in each week—making a total of 28 failures to comply with statutory requirements. At one station towards the close of last month, 14·6, 14·9, and 15 candles were recorded. On the other occasions, the figures were: 15·0, 15·2, 15·4 (twice), 15·5, 15·6 (five times), 15·7 (five times), 15·8 (seven times), 15·9 (three times). About the same time, Mr. Dibdin had to report an excess of ammonia; the mean of the testings at one station on the 29th, 30th, and 31st ult. being 4·3 grains per 100 cubic feet of gas.

Improvements in the Yeadon Revolving Retort.—Notwithstanding the constant endeavours which have been made to improve the Yeadon revolving retorts, resulting in the removal of some mechanical difficulties and the realization of increased yields, one problem has, till lately, remained unsolved—viz., the determination of the most suitable material and section for the bodies of the retorts, to ensure durability and secure the best results. With regard to the latter feature, the conical or tapering form is still retained; but cast iron has given place to cast steel, while the shell is made with longitudinal corrugations. By this arrangement, the amount of conducting heating surface is nearly doubled; the bodies, though lighter, are much stronger; while the warping or cracking, from unequal expansion, is likely to be obviated, owing to the shell being of the same thickness in every part. A further advantage gained by these changes is that the cost and time required for renewals are materially reduced. We learn that the Yeadon Gas-Retort Company, Limited, will very shortly have at work, at their Willow Place gas yard, Leeds, a retort embodying all the latest improvements.

TECHNICAL RECORD.

THE INCORPORATED INSTITUTION OF GAS ENGINEERS.

Pursuant to the requirements of the rules, the Annual General Meeting of the above Institution was held last Saturday, at the Offices, No. 11, Victoria Street, Westminster. The PRESIDENT (Mr. Alfred Colson, of Leicester) occupied the chair. As usual on these occasions, merely formal business required attention; and consequently there were only a few members present.

CONFIRMATION OF MINUTES.

The SECRETARY (Mr. T. Cole) read the minutes of the last annual general meeting held on Feb. 10 last year, and of the adjourned meeting in May; and they were confirmed.

ELECTION OF OFFICE-BEARERS AND MEMBERS.

One of the Scrutineers (Mr. T. S. Lacey), having examined the balloting-lists for the election of office-bearers for the ensuing year, reported that the following gentlemen had been appointed:—

President—Mr. C. C. Carpenter, of Vauxhall, London.

Vice-President—Mr. William Foulis, of Glasgow.

New Members of Council *—Mr. Charles Gandon, of Lower Sydenham; and Mr. John Young, of Etruria, Staffs.

Auditors—Mr. Magnus Ohren, of Sydenham; and Mr. Alfred Lass, of London.

* The other members of Council are: Mr. T. B. Ball, of Rochdale; Mr. J. F. Bell, of Stafford; Mr. W. Hardie, of North Shields; Mr. J. W. Helps, of Croydon; Mr. W. King, of Liverpool; Mr. G. T. Livesey, of London; and Mr. H. Peaty, of Burslem.

Mr. Lacey further reported that ten gentlemen had been elected as members and one as an associate of the Institution, as follows:—

Members: Mr. W. Anderson, Gas-Works, Hanover; Mr. C. Gandon, jun., Engineer, Aix-la-Chapelle; Mr. W. D. Gibb, Elswick Gas-Works, Newcastle-on-Tyne; Mr. H. B. Green, Longridge Gas-Works, Preston; Mr. H. W. P. Nugent, Gas-Works, Berlin; Mr. T. O. Paterson, Gas-Works, Birkenhead; Mr. H. H. Salomons, Gas-Works, Amsterdam; Mr. E. Thompson, Gas-Works, Berlin; Mr. W. V. Watson, Gas-Works, Amsterdam; Mr. Lewis T. Wright, Gas Engineer, Westminster, S.W. Associate: Mr. Douglas H. Helps, Gas-Works, Croydon.

The PRESIDENT moved that the Scrutineer's report be adopted.

Mr. CHARLES HUNT (Birmingham) seconded the motion, which was carried.

The PRESIDENT intimated that this concluded the business; and that the meeting stood adjourned to Wednesday, the 8th of May next, at the Institution of Civil Engineers.

THE EFFICIENCY OF CARBON VAPOUR IN COAL GAS AND OTHER HYDROCARBON FLAMES.

At the Meeting of the London Section of the Society of Chemical Industry at Burlington House on Monday last week, Mr. LEWIS T. WRIGHT read a paper of an exceptionally interesting character on the above subject. Owing to the rules of the Society prohibiting the publication of papers *in extenso* before they appear in their own "Transactions," we are unable to give more than an indication of the contents of Mr. Wright's communication.

Many of the scientific chemists who have studied the details of gas manufacture have endeavoured to trace a relation between the illuminating power and chemical composition of coal and similar illuminating gases. These efforts, though they have not been attended with success, have led to the advancement of our knowledge of the composition of coal gas, and have also brought about some improvement in methods of gasometric analysis. Among the various reasons that must have led to failure, even if such relation existed, must be cited: (1) The want of a definite system of photometry as applied to gases of various qualities. (2) The practice of arbitrarily dividing the hydrocarbons of coal gas into marsh gas and $C_n H_m$ hydrocarbons absorbable by fuming sulphuric acid. There is much uncertainty about the *rôle* played by marsh gas in mixtures; and there is the error also commonly held that coal gas can be disillumined by treatment with fuming sulphuric acid.

The author repeats his observation that marsh gas is but a convenient mode of expressing the carbon of the paraffins present in coal gas. It is known that, if the $C_n H_m$ hydrocarbons be removed, the residual luminosity is 40 per cent. of the original; and the author asks if, supposing the reverse operation could be performed, and only the so-called marsh gas be taken out, whether the residual gas would then possess 60 per cent. of the original luminosity. He states that, in mixtures such as coal gas, methane has a very important luminosity. His idea, which was illustrated by the analyses of four samples of gas ranging from 15·6 to 20·5 candles, that there was a relation between the total carbon of the gas and its illuminating power was repeated, but not extended, by Professor W. Foster.*

The use of the word intrinsic luminosity to hydrocarbons is unfortunate, as we know nothing of the intrinsic luminosity of such bodies which can be made to produce luminosity from zero up to limits not yet reached according to the manner of consuming them. There is, however, a conventional luminosity that is the maximum that can be obtained with the ordinary flat-flame and Argand burners. The want of a burner especially adapted to very low qualities may have originated the idea that methane and coal gas deprived of the $C_n H_m$ hydrocarbons possessed no practical luminosity. The operation of photometry is not capable of the accuracy obtainable with other scientific methods, such as weighing, &c.; nor has it been reduced to a system so far as gases of different qualities are concerned. Luminosity is not a fixed property, unless all the conditions are fixed. Change these conditions, and the luminosity changes.

The author, in the course of his experience with gases of widely different quality and origin, has found that, if only the carbon combined with hydrogen be considered, there is a relation between the luminosity and composition. To state the rule in a simple practical form for application to gases, it is necessary to consider that the carbon is of density 1—that is to say, treat the carbon as though the average hydrocarbon molecule contained but one atom. Thus, for the purposes of applying the constant, all the carbon combined with the hydrogen must be calculated to density 1. The same result is obtained if the equivalent volume of carbonic acid be taken; or the quantity of carbonic acid that would be yielded by the gas on combustion with oxygen after deducting the carbonic oxide and, of course, any carbonic acid originally present. The author's experiments have been made upon carbonic acid and air-free gases. He finds that every cubic foot of carbon vapour so expressed has a lighting value of about 7 candles, according to the class of gas. Thus ordinary 16-candle gas may contain 50 volumes of carbon vapour per 100 volumes, or 0·5 cubic foot per cubic foot of coal gas. Taking the constant of 6·65 candles for such gases, 0·5 cubic foot would give $0{\cdot}5 \times 6{\cdot}65 = 3{\cdot}325$ candles per cubic foot, or 16·675 candles per 5 cubic feet. For oil gases he has obtained values of about 6·9 candles per cubic foot of carbon vapour. He refers to various authorities, and shows that their analyses, calculated according to his method, give similar values. For petroleum burning in a "Duplex" lamp, he has obtained values of from 6·7 to 7·33 candles per cubic foot of carbon vapour; and he explains how it is that the values obtained for hydrocarbons in the pure state are not necessarily reproduced in mixtures.

Referring to the use of oil for enrichment purposes, he shows that if 25 per cent. of the oil on destructive distillation be kept as residue, then the remaining carbon, on taking the constant 7, or its equivalent of 221 candles per pound weight of effective carbon, should give 1127 candles per gallon. In his own experiments, he has reached 1084 candles. The author, alluding to the value of these oil gases for enrichment, thinks it necessary to have analyses of the enriched gases, in order to decide the point whether the enriched gas has a higher carbon efficiency than the gases separately. Petroleum in lamps gave from 1580 to 1680 candles per gallon. In that case, all the carbon is consumed; and the carbon efficiency varies from 6·7 to 7·3.

In carburetted water-gas processes, values of from 1300 to 1500 candles are obtained; and it is necessary to have analyses, before deciding whether this higher value be due to increased carbon vapour put into the gas by cracking the oil in water gas instead of its own vapour, or if it be from an increased efficiency of the carbon vapour.

The author points out that the ratio of carbon to hydrogen in these gases can differ immensely without any great change in the efficiency of the carbon vapour. He also refers to the very discrepant results given for benzol as an enricher, and points out that some of the results do not justify the conclusions drawn from them. He further asserts that some of the so-called enrichment curves are really only curves on account of the inequality of the system applied in testing photometrically the various mixtures.

It is also stated in the paper that the marsh gas prepared from sodium acetate, which, though consisting mainly of marsh gas, is not pure, being accompanied with many other bodies, gave, under conditions that were perhaps not favourable to the full development of its maximum, a luminosity of 5·73 candles per cubic foot of carbon vapour.

Several other matters are referred to in the paper, such as the probable effect of cheap enrichment and the distillation of coal. On several occasions the author has shown that an increase of destructive distillation of coal brings out more lighting value from the coal, though the gas obtained is of a lower grade. This increase is, of course, attended with the permanent gasification of more carbon, and appears to be principally at the expense of the tar. On taking charge of the Nottingham Corporation Gas-Works in 1883, he found that there was a coal mined on the outskirts of the town, which for years had been regarded as useless, though the coalowners were willing to deliver it at 6s. per ton. The coal had been tested, and was found to yield very little gas, and was consequently despised. The author examined the coal, and found that, at a temperature perfectly practicable in gas-works,

* See JOURNAL, Vol. LIX., p. 1174.

it would yield remarkably good results. In the paper, he gives a large number of results obtained from this coal, at various temperatures. They ranged from—

Cubic Feet per Ton.	Candle Power.	Value in Candles per Ton.
6,595 ..	23·56 ..	31,076
11,001 ..	20·08 ..	44,180

The result of using this coal was immediately to produce a saving that amounted, before the end of the year, to £10,000, which sum was quickly absorbed in the borough rate of the town. Now that the price of petroleum and paraffin oils is so moderate, and the cost of enrichment is not a serious matter, the author thinks that high yields will come more into vogue. Of the selling price of gas in the Metropolis, 80 per cent., he says, is made up of charges that are quite independent of the quality of the gas supplied; and that figure would be the same if the gas were either of 14 or 18 candle power. Of this large proportion of 80 per cent., it is generally found that the cheapest light is that supplied at the highest grade; and, for example, the author instances London, Liverpool, and Glasgow:—

	Candle Power.	Cost per Candle of the Standard.
London	16·3 ..	2·08d.
Glasgow	21·3 ..	1·54d.
Liverpool	21·6 ..	1·66d.

After his experience in the manufacture of gas in London, Nottingham (where it was 18¼ to 18¾ candles), and at Buenos Ayres (with gas at 25 candles), the author is at a loss to understand the arguments in favour of the reduction of the standard of illuminating power in London. He regards this as a retrograde step, and likely to lead to a serious loss of prestige. He considers that it is against economical principles, since, to-day at least, gaslight can be supplied cheaper at a high than at a low grade. He acknowledges the lower price appeals to the agitator; but quality, he says, appeals more to the consumer.

In conclusion, Mr. Wright says he hopes, now that attention has been directed to the efficiency of carbon in coal gas and other hydrocarbon flames, that the analysis of gas may be employed in combination with the photometer, and then, he thinks, we shall learn much more about the efficiency of carbon than he was able to tell his auditors that night.

In the course of the discussion which ensued,

Dr. S. Rideal remarked that it was rather difficult to say much upon a paper when one heard it rather hurriedly; and unfortunately they had not had an opportunity of seeing this paper in print before it was read, to enable them to discuss it in detail. In his final remarks, the author certainly threw down the gauntlet in favour of a high standard for London and town gas, although many gas experts at the present time were in favour of manufacturing gas of low grade. It seemed to him that the arguments used in favour of a high standard were based purely upon gas as an illuminating agent, and its value as a heating agent or a source of energy was ignored entirely. He should like to ask whether the author had come to the conclusion that gas in future would be simply an illuminating agent as it had been in the past, or whether, in view of the competition of the electric light, that gas was not likely to have other uses, and, therefore, would it not be better to judge the value of the gas by the heating value rather than as measured by the photometer?

Mr. J. T. Westcott observed, with regard to the subject of the illuminating power of marsh gas, that they obtained a greater benefit in its heating power than in its illuminating power; and this was borne out by theory. In burning a cubic foot of marsh gas, they realized almost 1000 British thermal heat units, whereas with coal gas, they only got 650 units. Then, again, the reason they derived, with carburetted water gas, such a high illuminating power from a gallon of oil was due to the way in which it was cracked up in combination with the water gas. This was principally owing to the manner in which it was dealt with in the apparatus; and in the results they found certain chemical reactions. A man who could thoroughly handle his apparatus could bring out entirely different chemical combinations; and when these were subjected to photometrical tests, it was found that, instead of 1300 candles per gallon, they only received 600, 700, or perhaps 900 candles.

Dr. Dvorkovitz, having remarked that he had listened with great pleasure to the paper, said that everybody who had had to deal with the testing of gas by the existing apparatus had often felt the necessity for having some other means of testing; and he was sure that they would all be pleased to support the method which the author now proposed, which was really a chemical method. With regard to the efficiency of the illuminating power, the author took the unsaturated hydrocarbons of ordinary coal gas—say, 3·5 per cent. by volume, representing 16 candles, which was equal to 5 candles per volume; and then he said that it was strange that the hydrocarbons which were produced by oil gas did not give such high illuminating power.

Mr. Wright: No, no.

Dr. Dvorkovitz: You said that oil gas which contained 50 per cent. of hydrocarbons, only gave 60 candles. It generally contains 40 to 50 per cent. of unsaturated hydrocarbons. I am speaking upon the question which you have raised.

Mr. Wright: I did not consider the hydrocarbons separately, excepting *en bloc*. I have purposely made no separation—no artificial separation—between saturated and unsaturated hydrocarbons.

Dr. Dvorkovitz: You say that the efficiency which you show by calculating the volume of 40 per cent. of marsh gas and of the other hydrocarbons in ordinary coal gas does present an efficiency of 6·7 per cubic foot; whereas, in the case of the oil gas, taking the same efficiency would show about 1200 candles only per gallon. The main point in your paper, so far as I have seen, is this—that the efficiency per volume in ordinary coal gas represents more candles than it does in oil gas.

Mr. Wright: The figures I gave you would be slightly more, because I showed you that the oil gas gave 6·9 and 6·83 candles per cubic foot of carbon vapour in two cases.

Dr. Dvorkovitz (proceeding) said that, if they mixed a rich oil gas with coal gas, the illuminating power would then be the same, if no larger, per volume. He could not find any special difference between the character of the unsaturated hydrocarbons in the coal gas and in the oil gas. There was a certain difference in the oil gas, so far as they contained a larger amount of benzol; it consisted more of the benzol series than of the ethylene series. This difference was certainly in favour of the oil gas. He could not understand the figures that Mr. Wright had given as to the large variation in the yield of gas per ton of the same coal—6595 cubic feet of 23-candle gas in one case, and 11,000 cubic feet of 20-candle gas in the other. It seemed to him (the speaker) rather strange that such a coal should be despised altogether; and he would like to be informed by Mr. Wright how he obtained these very high figures from such a poor coal. Was it a certain method of cracking? If so, the engineers of the London Gas Companies would be very thankful to Mr. Wright if he would inform them what that method was, as it would save the Companies a lot of money, besides being generally interesting. Mr. Wright had also spoken of benzol. It seemed to him (the speaker) rather strange, after all the work that had been done in connection with benzol—not only in the laboratory—by that great authority Dr. Bunte (whom he believed all scientific men in the world respected), that his figures were not given. Those figures referred to the enrichment of the gas at the Munich Gas-Works; and they were quite opposed to what Mr. Wright had achieved with benzol—that was, as an enricher. At Munich, they were using benzol as an enricher; and they realized, if he remembered rightly, about 22,000 candles per gallon—this meant 22,000 cubic feet of coal gas by enriching with one gallon of benzol. He thought the author ought not to have passed over such facts. What they wanted were not experiments made in the laboratory eight years ago, but the experiments which had been made recently, and the results of many of which had been published in the gas journals; but, in his paper, the author had told them nothing of what was going on at present. He quite agreed with Mr. Wright that the question which had been taken up lately by gas companies with reference to the reduction of the illuminating power of gas was rather against their interests. But he did not think they seriously meant it; and, in his opinion, it had only been taken up in order to frighten the suppliers of cannel and oil. The main point of the paper appeared to him to be that of introducing the chemical method of testing gas. In such an idea, every chemist should be interested, as they had hitherto been rather despised in the gas world.

Mr. T. S. Lacey, of the Pimlico station of The Gaslight and Coke Company, said the paper showed that Mr. Wright had given an immense amount of time and labour to all the details with which it was crowded. The facts were very numerous and interesting; and, though no doubt simple enough when in print, at such short notice, it was impossible to grasp the subject in such a way as to give it adequate consideration. However, there were some points he thought he could manage to grasp. Mr. Wright did not appear to attach much importance to the combination of the carbon with the hydrogen—that was to say, the hydrogen density—although some ten or twelve years ago, it was regarded as of great importance. In considering the effect of the hydrocarbons, Mr. Wright was inclined to disregard it—at least, he (Mr. Lacey) thought that was the effect of his experiments. Now that hydrocarbons were being used for enrichment, if it were true that the nature of the combination of the hydrogen was not important, there might be a great saving or loss in using various hydrocarbons of the same number of atoms of carbon. For instance, hexane was now commonly used with a small quantity of paraffins of a higher boiling-point; and it would be of great interest to know what was the relative value of benzene compared with hexane. He should like to know whether Mr. Wright could state, from any experiments he had made, or whether he thought that there was sufficient evidence to show, that benzene had a much higher value than hexane; there really ought to be some means of ascertaining whether or not this was true. Taking the latest evidence given as to the superiority of benzol over carburine or hexane, he (Mr. Lacey) should say that benzene had a much higher value than the paraffins containing an equal number of carbon atoms; but the material which was used in gas-works for enriching purposes was infinitely cheaper per gallon than benzene was now, or was ever likely to be. The factor Mr. Wright had given for the carbon vapour (which was an admirable way of expressing the carbon in the gas, and was easily understood by anyone who had made

volumetric analyses) was remarkably interesting, and he thought, might be very useful. He was greatly surprised to see that this factor had varied so slightly in a large number of gases that had been tested. The series would be very valuable; for their range included the illuminating values gas managers were dealing with in every-day practice. It seemed to him that those who had the power of testing gas photometrically, had the means of telling whether they were attaching a ridiculous value to a gas, and if the carbon vapour value, as multiplied by this factor, was not anything like what they expected, he should certainly feel inclined to repeat the experiments to see whether any mistake had been made. Now that oil gas was coming so much into use, and there were so many processes, it would be a great advantage to know what were the possibilities of a gallon of oil, because it seemed to him, from what he saw in the technical journals, that they were getting more and more elastic. It appeared to him that Mr. Wright had a strong opinion himself that there was a maximum value that could be got out of a gallon of oil, and that more could not be obtained. As to the figures that were sometimes put before them, it was very certain that the factor was by no means confined to the small limits attributed to it by Mr. Wright; but it was most variable, so that it would be difficult to plot out from it any figures that would form an average which would be of the slightest use to anyone.

Mr. E. Wood said he had been interested for many years in the manufacture of coal tar products; and he might mention the fact that coal tar pitch was at one time perfectly soluble in solvent matters, but now it was not so. This showed that something different had been introduced into coal gas manufacture during the last few years. The question he wanted to ask was, Were gas managers making a gas purely for illuminating purposes, or were they making a gas for its heating power? In other words, were they trying to sit on two stools, or were they trying to slip between the two?

Mr. Frank Wright, referring to the last speaker's question, observed that his experience did not lend colour to the statement that any quality of gas was good enough for gas-engines or cooking-stoves.

Mr. Walter Grafton, alluding to the results of the tests which the author had quoted, and to the testing of gas by the "London" Argand burner, pointed out that, if different qualities of gas were consumed in the burner with a fixed height of flame, or an approximate height, and if they substituted for that a light equal to eight on the scale, very different figures to those shown by Mr. Wright would be obtained.

Mr. Wright, in replying to the discussion, said he was rather surprised to hear the question put by Dr. Rideal. Did that gentleman think that a gas to be a heating gas must be a low-grade and non-luminous gas? because he (Mr. Wright) knew that it was a belief in certain quarters that a heating gas was not a lighting gas, and that a lighting gas was not a heating gas. He could not understand how such an idea originated, because as they increased, in practice, the lighting power of a gas, they increased its carbon density and its hydrogen density; and, per cubic foot, they obtained, with increased lighting power, a corresponding increase in the heating power. Dr. Dvorkovitz objected to him going back very far; but nevertheless he might perhaps be allowed to say that, some time ago, he read a paper before the Manchester Section of the Society in which he tried to combat the idea (which, he believed, originated with Dr. Siemens) that there should be two qualities of gas—one for lighting purposes, and one for heating. The most rational means should be the strongest heating gas, and that unquestionably was the strongest lighting gas—the two went side by side. He felt very sorry that anyone should have misunderstood what he had said. It appeared to him that Dr. Dvorkovitz had completely misunderstood all he had been saying; and, for his own part, he believed he had completely misunderstood all that Dr. Dvorkovitz had said. He hardly thought it necessary to refer to the figures as to the yield of gas per ton of coal to which the Doctor had called attention, because he believed that to anyone acquainted with the manufacture of gas they were perfectly intelligible. The experiment to which he alluded was upon the distillation of coal at various temperatures. It was well known that, at a high temperature, they produced a larger volume of gas than they did at a low temperature; and, at the same time, the higher the quantity of the gas, the lower was the value. Dr. Dvorkovitz on this occasion had not referred to his own experiments. He had, however, called attention to those carried out by Dr. Bunte; but, as he (Mr. Wright) had already observed in his paper, he did not like to add to the confusion concerning the value of benzol. If he could obtain the results that Dr. Dvorkovitz realized, he should never say anything about them, because he should feel that, if ever he had to come down, he should have to come down a very long way. He did not wish to be drawn into things that did not come within the scope of his paper; he had confined himself strictly to facts, and had gone very little away from the results of actual experience. This was a fact which he wished to impress upon those present: That, if they took these hydrocarbon flames, whether they took them at low or high grade, if the oil was burnt in a paraffin lamp, it seemed strange that the value in candle power obtained from the carbon consumed varied but very little. In the figures he had shown, it varied from 6½ to 7½ candles per cubic foot of carbon vapour. He believed that they could say, with great exactitude, that the value of the carbon vapour in the coal gas supplied in England was 6·7 candles. If they took a coal gas that gave on combustion, after deducting the carbonic acid, 50 per cent. of carbon vapour, it seemed to him that this gas would give nearly 16¾ candles—

$$0{\cdot}5 \times 6{\cdot}7 = 3{\cdot}35 \times 5 \text{ cub. ft.} = 16{\cdot}75 \text{ candles.}$$

A gas that gave 50 volumes of carbon vapour, after making a deduction of the carbonic acid, would give a value of between 16½ and 17 candles. He believed that value was very close. With regard to oil gas, they had not sufficient information to enable them to fix the value with the same certainty as they could for coal gas such as was supplied in England. It would, however, appear that the value was slightly higher; but he did not say it would be higher if a great number of experiments were carried out, and if those experiments were made on exactly the same photometrical system that was applied to the coal gas. He would call their attention particularly to the remarkable fact that the value of the carbon in petroleum and paraffin oils, burning in ordinary lamps, was the same as was obtained in coal gas. He should have liked to have heard from Mr. Westcott some more information as to carburetted water gas; but he did not think there was anything in his remarks which needed a reply from him. As to the inquiry respecting tar, he must say that he always objected to be called out into ground that did not belong to that which he had taken up. As to the reference which had been made to Argand burners and their efficiency, he thought he might again be permitted to go back to ancient history. Some years ago, he showed that, when an Argand burner was burning at various low rates, the efficiency obtained from the gas was very low indeed; so the practice he believed since that time had been (because, as he had mentioned in his paper, when they got into the region of experiments in different qualities of gas, they were not bound any longer by the restrictions of the London Gas Referees), in testing a gas experimentally in the laboratory with a "London" Argand, to try to get the maximum efficiency out of the gas. He believed that it was now also the custom in experimental work to burn gas in a "London" Argand with a full chimney; and the want of method in photometry was what he had spoken of in his paper. He knew that the paper was a very difficult one to understand on merely hearing it read; and he should have preferred circulating it beforehand, because he knew it was quite impossible for gentlemen, however well they might be acquainted with the subject, to discuss a matter that was suddenly brought before them. When they were able to read the paper, he believed they would see there was something in this question of carbon efficiency.

The Chairman (Mr. B. E. R. Newlands) said he was not a gas expert; and the point which had troubled him in connection with the paper was, What is a foot of carbon vapour? The author had suggested a new chemical standard for testing gas; and this standard was dependent upon a foot of carbon vapour. [Mr. Wright: That is to say, its equivalent.] The meaning of that was this: That a foot of ethylene was equal to 2 feet of carbon vapour; and a foot of benzol was equal to 6 feet. That smoothed the way as far as he was concerned. He expressed regret that there were not more gas experts present; and, referring to the question of the distribution of the papers *in extenso*, he said the objection to this was that they were apt to get into trade papers, and so be published before they appeared in the Society's own *Journal*. He concluded by moving a vote of thanks to Mr. Wright for his interesting paper.

The motion was cordially agreed to.

SOCIETY OF ENGINEERS.

The First Ordinary Meeting of this Society for the present year was held at the Westminster Palace Hotel on Monday evening last week. The retiring President (Mr. G. A. Goodwin, M.Inst.C.E.) occupied the chair at the commencement of the proceedings, and, in the unavoidable absence of Sir R. Rawlinson, K.C.B., presented the premiums awarded for papers read during the past session, as follows: The President's Gold Medal to Mr. T. W. Baker, for his paper on "The Utilization of Town Refuse for Generating Steam;" the Bessemer Premium to Mr. Ed. C. De Segundo, for his paper on "Power Distribution by Electricity, Water, and Gas;"* the Rawlinson Premium to Mr. R. Nelson Boyd, for his paper on "A Deep Boring near Friestadt, Austria, by the Canadian System;" and a Society's Premium to Mr. H. B. Ransom for his paper on "The Principles and Practice of Hydro-Extraction."

Mr. Goodwin then briefly introduced to the meeting the President for the current year (Mr. W. G. Peirce, the Water Engineer to the Richmond Corporation), and vacated the chair; receiving a hearty and unanimous vote of thanks for his services during his term of office.

The President then proceeded to deliver his Inaugural Address. After thanking the members for having elected him to the presidency, he noticed the papers read and the works visited during the past year, and pointed out the present satisfactory position of the Society, both numerically and financially. He

* An abstract of Mr. De Segundo's paper, with a report of the discussion upon it, was given in the Journal for June 12 last (p. 1117).

then referred to the progress of electrical traction, as evidenced by the City and South London Railway and the Liverpool overhead line, the successful working of which, he said, had paved the way for the Waterloo and City electric line, of which he gave particulars. Inland navigation was then touched upon in connection with the conference in Belgium. After alluding to the opening of the new lock and weir at Richmond, and its satisfactory results, and the opening of the Manchester Ship Canal and the Tower Bridge, the President gave some particulars of the Blackwall Tunnel now in course of construction. He then went on to deal with the question of water supply, which formed the chief feature of the address. His remarks on the subject were as follows.

Turning to water supply, I may say that Liverpool is to be congratulated upon having obtained a plentiful service of water from Lake Vyrnwy, in Montgomeryshire, Wales. She will now be out of her difficulty in this respect; having for several seasons previous to the completion of the aqueduct tunnel had to restrict the water supply to the inhabitants during the summer seasons. But Liverpool, like Manchester, can now look forward to an inexhaustible water service, so long as there is a moderate rainfall. Birmingham has now definitely decided in favour of a gravitation scheme, and has already commenced supplementing the present water supply by a grand scheme like that just completed for Manchester. Edinburgh is also contemplating the adoption of a similar scheme to that of the other large towns—viz., a gravitation supply. This is, no doubt, rendered necessary by the increase of population, and the growing requirements of the improved system of sanitation. Leicester, although, like the places already referred to, having a gravitation or lake supply, has during the past summer been put to the greatest inconvenience owing to the want of rain; the water storage there evidently being too limited for the growing requirements of the town. The present storage capacity of the reservoirs is about 889 million gallons of water; and at the consumption of 17 gallons per head of the population (which is the average quantity, when the water has been turned on for 24 hours per day), it is capable of supplying a population of 235,000 persons. The population at present supplied with water is estimated at 206,480. In the year 1890, the Corporation went to Parliament for powers to acquire land and raise capital for an additional storage reservoir to hold 550 million gallons. These works are in course of construction; and, when completed, the Corporation will have, with an average rainfall, a water supply equal to the demand of a population of more than 300,000. The rainfall in the district averages 28 inches; and in the year 1891, it amounted to 32 inches. In 1892, it was slightly under 23 inches; and in 1893, slightly under 22 inches. In 1894, up to Aug. 4, it was only 15¼ inches. The Corporation, on finding the store of water rapidly diminishing, took steps to obtain an auxiliary supply from wells belonging to large mills in the neighbourhood—they themselves also sinking shafts for increasing the supply. With the experience thus gained, and after the severe drought of the past year, water engineers not only at Leicester, but also those of many other towns, will do well to look carefully into their sources of supply—whether the supply is taken from lakes or from springs deep seated in the earth. Both systems suffer from a deficient rainfall; and it is now an anxious question with engineers how to best provide the necessary supply of water, and to avert the danger of a water famine in our great and growing cities and towns, which depend for their very existence on an abundant water supply.

The Royal Commission on Metropolitan Water Supply has completed its labours, and has presented a most exhaustive report on the present supply and future requirements of the Metropolis; having called in and obtained the advice of the most experienced eminent engineers, geologists, and scientists in the country. As might be expected on such an important inquiry, opinions differ as regards the most efficient and satisfactory means of ensuring a constant and unfailing supply of uncontaminated water for the present population, and to meet all the possible requirements of the future. Some witnesses advocated the present available sources of supply from the Thames, the Lea, and the New River, supplemented by wells in the chalk. At the same time, they advocate the construction of immense storage reservoirs in the Thames Valley for the purpose of collecting the flood water in the rainy season, to meet the additional wants of the future increase in population. The boldest and grandest of all the schemes proposed was to secure one or more of the large Welsh lakes, so as to provide and ensure for all time, for the greatest city in the world, the abundant supply of water necessary to the preservation of health to its millions of inhabitants.

Considerable interest attaches to the points brought out in the evidence taken before the Royal Commission just referred to, as regards the probable quantity of water used in London, and the probable requirements of the Metropolis as estimated for the year 1931. The returns made by the eight London Water Companies to the Official Water Examiner in 1891, gave the daily consumption of 182,456,905 gallons. Five Companies are authorized to draw 120,000,000 gallons per day direct from the River Thames—viz., the Chelsea, West Middlesex, Grand Junction, Lambeth, and Southwark and Vauxhall. In addition, the East London Company are authorized to draw 10,000,000 gallons; bringing up the total to 130,000,000 gallons. The East London and the New River Companies between them took an average daily supply from the River Lea of 55,500,000 gallons. Thus we have the Rivers Thames and Lea supplying the "lion's share" of water; they being drawn upon to the extent of 185,500,000 gallons per day. The Kent Water Company stand alone with a supply from wells in the chalk. The large quantity of water required for our daily wants is found, practically speaking, at the very doors of the consumers, almost at the four points of the compass. The question that is now uppermost in the minds of those responsible for the health of the great Metropolis is how long the present main sources of supply—that from the rivers—can be drawn upon with safety. Towns spring up where only villages once existed; and every year the Water Companies report a large increase in the number of connections with their several mains. Steadily and surely London is advancing along the river banks towards Kingston. The pretty little suburban towns of bygone years which are nearest to London have been found too urban; and City men, with the facilities provided by the railway companies, now travel to the villages surrounding the present intakes of the Water Companies. There is not the slightest doubt that, as the pioneers of water supply had in years past to move higher up the river on account of building operations crowding in the works, so in time it will become necessary to beat a still farther retreat. At the present time, however, the water supplied by the river is found to be, by efficient filtration, wholesome, and practically free from pollution; the health report being likewise satisfactory—London being the healthiest of all our large towns. All this goes to prove unmistakeably that there is no immediate danger.

Then why should we be disturbed in our minds about the future, when everything is progressing so favourably now, while recent droughts, almost unprecedented, have proved beyond doubt that the resources of the Metropolitan supply are equal to the demand? The answer is that we have one exception which must compel us, as water providers, to look ahead; and that exception is Leicester, with its recent water famine. Water, although regarded in this country as the commonest of the necessaries of life, is not really sufficiently valued until the supply runs short; and yet it is one of the elements not easily procured in certain localities when the rain falls below the average, especially for two or three years in succession. When we consider the fact that the development of a new and reliable source for a large population may take from 12 to 15 years to accomplish, it behoves us to be at all times in advance of the existing available supply. We must remember that Liverpool had to restrict her consumption long before the present magnificent service was available from Wales; and Manchester again commenced to develop her new supplies years before the water was actually needed. This has been the principal reason of the question being opened up by the London County Council, in order to provide for future contingencies; and when it is considered (as estimated by those engineers conversant with the matter) that, in the year 1931, provision must be made to supply 294 million gallons per day, to meet the requirements of the estimated increase in the population, it will be seen that the means of providing this enormous daily supply must be taken into consideration, and the problem solved without delay. At the present time, our Metropolitan water engineers are engaged in constantly increasing and enlarging their works. Those taking the bulk of their supply from the Thames and Lea, being restricted as to the quantity to be extracted, have judiciously opened up the gravel beds overlying the London clay, with encouraging results; and so long as building operations do not intrude within reasonable distances of these new sources and contaminate them, all will be well. These works, however, are situated in some of the most picturesque spots on the Thames; and therefore they cannot be long sacred from the speculator and builder. Other water engineers have been, and are now, sinking wells and driving adits in the chalk strata—some with good results, where the outcrop of the chalk was favourable. Our Past-President Mr. Valon treated this subject very fully in his Inaugural Address in 1893,* and dwelt especially upon the Kent Water Company—this being the only Metropolitan Company taking its entire supply from wells in the chalk—and expressing a strong opinion as to the possibility of getting a very large increase from this source, to meet the growing requirements of the other Metropolitan Companies. With regard to the Kent Company, we must take into consideration the fact that their works are in a most favoured situation, on the outcrop of the chalk on the south-east of London, with open country right into the water-bearing strata of Kent.

With regard to the progress made by other London Companies of augmenting the present supply of water for the ever-increasing consumers, the New River Company have in use ten wells, with others not yet employed, with a natural spring at Chadwell. The Engineer of the East London Water Company (Mr. W. B. Bryan, M.Inst.C.E.) has been busily engaged for some years in sinking wells and driving adits in the chalk at Lea Bridge and in the neighbourhood, to supplement the river water supply. Through the courtesy of Mr. Bryan, I have been able to inspect two of these wells—viz., those at Lea Bridge and Walthamstow. Although these wells are within the area of the London clay—the floor of the adits being within 300 feet of the surface of the ground—they are fortunately sufficiently near to the outcrop of the chalk to ensure success, and are yielding upwards of 3 and

* See JOURNAL, Vol. LXI., p. 223.

4 million gallons of water respectively. Other wells in use in connection with these works are giving even better results; and I am informed that more wells are now in progress, and other great additions are being made for storage and filtration. The East London Company are, as regards consumption, the largest of the eight Metropolitan Water Companies—heading the list in 1891 with a net daily supply of nearly 40 million gallons; whereas the Kent Company, whose supply is taken entirely from wells in the chalk, had to provide but 12½ million gallons per day. Taking into consideration the fact that the water-level in the chalk has been sinking at the rate of a foot per annum during the past 40 years, what must the result be when more water is abstracted from this source of supply? This steady and absolute reduction in the chalk-water level must certainly be taken into account in calculations for the future. In some operations, very large fissures have been intercepted in the chalk—notably in the Lea Valley. Whether or not these exceptionally large fissures are in direct communication with the neighbouring streams, is a question time alone can answer. Long experience in dealing with chalk wells has shown that those deriving a supply from what is usually termed the "bleeding" of the chalk and from the ordinary faults and fissures, gradually, but surely, exhaust in the course of a few years the area drained; and, at very regular intervals, the water engineer finds it necessary to tap fresh ground by extending the adits. The late Mr. Topley, in his evidence before the Royal Commission, is reported to have expressed the opinion, when supporting Mr. Bryan's proposals for increasing the supply for the East London Water Company for the future, that there was something peculiar in the lower part of the Lea Valley which enabled it to yield an unusually large quantity of water. For instance, in the area above referred to, one well with about 50 feet of adits yields 4 million gallons per day, while another well not far distant yielded about the same quantity of water, although tunnels have been driven more than 7000 feet in length.

The Kent Water Company have already been referred to, with reference to what may be accomplished by sinking wells, and the almost certain success in obtaining water from the chalk. Many wells in this stratum require an extension of the adits at regular intervals, owing to the falling off in the yield. This should not surprise us when we take into account the additional number of wells being opened up, and the increased quantity of water necessary to meet modern sanitary requirements. Not only are towns demanding more water, but villages are combining and adopting the same sanitary arrangements. The natural consequence is that the underground source of supply is being drawn upon to such an extent that slowly, but surely, the level of water is being lowered, especially where the fissures in the chalk depend upon saturation, and are not in direct communication with surface springs or streams. This is the case at Richmond (Surrey), where great efforts have been made during the past eighteen years to obtain a supply of water from the chalk, which is 254 feet below the surface of the ground. Here the Local Authority took upon themselves the responsibility of supplying the town with water; and at the commencement were advised to sink a well into the chalk, and then to bore a further depth of 150 feet. Should this not prove successful in yielding the required supply, they were advised that adits should be driven. Owing to an accident, however—the cast-iron cylinders breaking just above the chalk—the latter alternative had to be abandoned. As Resident Engineer, I suggested sinking a new well, in order to carry out the plan as originally advised by the engineering experts; but upon the Local Authority consulting an engineer of great experience in well sinking, they were advised to make a boring to a depth of about 1000 feet to the lower greensand; and this course was decided upon. This boring was continued to a depth of 1446 feet into the red sandstone, and proved the absence of the lower greensand, and only improved the supply from the great oolite by 15,000 gallons per day. It was then decided that this boring should be stopped; and since its abandonment, a new well—some 800 yards distant from the original well—has been successfully sunk by me 30 feet into the chalk. At a depth of about 320 feet from the surface, adits have been driven in all directions, principally north-east by south-west; intercepting, almost at right angles, many fissures and faults in the chalk. At the close of last year, 4657 feet of adits had been driven; the dimensions being 6 ft. by 4 ft. 6 in. Some of the fissures intercepted continue to yield the same quantity of water as when opened out; but they may give out after a time, as already mentioned—necessitating tapping new ground. The total yield at the present time is but little over 200,000 gallons per day.

The President then went on to refer to the distribution of water, and the prevention of waste; saying that the domestic supply to Richmond, by the aid of one waste inspector and ten Deacon waste-water meters, averaged only 18·3 gallons per head per day. He also referred at some length to the question of the advisability of metering the water supply to a town; and he described fully the working of one particular kind of meter, for the measurement of large volumes of water. He also alluded briefly to the paper recently read by Professor Vivian B. Lewes before the Society of Arts on acetylene (*ante*, p. 168) as bearing on the question of substitutes for coal; and concluded his address by a reference to technical education, which he said was of no practical value to the young engineer unless combined with knowledge gained in the factory and workshop.

REGISTER OF PATENTS.

Shades and Reflectors for Gas-Lamps, &c.—Heron, T., of Birmingham. No. 3184; Feb. 14, 1894.

This invention relates to appliances connected with gas and oil lamp reflectors and shades, for effecting brilliancy of light; also to forming a gas-burner in such manner that the shade or reflector can be turned upward clear of the flame, without necessitating its removal.

Gas-Joints.—Best, R. H., of Handsworth. No. 3600; Feb. 20, 1894.

This invention—applicable more particularly to "Surprise" pendants—has for its object "to produce gas-joints for swivels or taps which shall with use wear for themselves new bearings, and so remain gas-tight." It consists, firstly, in the employment of a spring and washer, flanged drum, and set-screw or pin, instead of a screw and washer; and, secondly, in the methods by which the spring is enabled to accomplish its object by lengthening the plug and screwing the same, by next passing a washer over the screw, and by screwing on a drum with a flange on the end farthest away from the barrel. On this drum is a spiral spring, which takes its bearing against the flange at one end and against the washer at the other end; and in the drum is a set-screw or pin, to keep the drum from turning when fixed in position. This arrangement allows the washer to be tightened to any degree by the drum; while the spring afterwards pushes against the washer, and keeps the barrel up to its bearing in case of wear.

Fluid Meters and Motor Engines.—Schönheyder, W. A. G., of Clapham, S.W. No. 4702; March 6, 1894.

This fluid meter (also applicable as a motor engine) is constructed as follows: Within a closed chamber that communicates with the supply of fluid under pressure are three cylinders with pistons, arranged at equal distances around a central pillar containing ports and passages, presently described. These cylinders are by preference open at both ends, and are fixed in seatings in the chamber in such manner as to form below the one end of each cylinder an enclosed space that only communicates with the other part of the chamber and the discharge passage through ports and passages in the central pillar. The other end of the cylinders is in open communication with the chamber, so as to be always subject to the pressure of the liquid therein. The upper end of the pillar has a hemispherical head; and on the accurately prepared spherical surface of this, fits a corresponding hemispherical cap. This cap, which constitutes a slide-valve, has three arms projecting from it, to which are connected the piston-rods of the three cylinders by ball-and-socket joints. The central pillar has, firstly, a central passage communicating at the bottom with a discharge passage, and at the top with a central port on the hemispherical head; and it has three other passages arranged round the central one, each of which communicates at the lower end with the space below one of the cylinders, and at the upper end with a port on the hemispherical head. The ports are arranged symmetrically round the before-mentioned central port. The cap, which constitutes a slide-valve controlling these ports, has a central cavity, of such a form that it can establish communication between the central port and any one or two of the three other ports—thereby putting such port, and consequently the space below the corresponding cylinder, in communication with the discharge passage. Round this cavity three ports are formed in the slide-valve, corresponding in position to the three above-mentioned ports in the head, and so arranged that, when the slide-valve is in a position to connect the central discharge port of the head with one of the cylinder ports, by means of the central cavity, the other two cylinder ports are more or less uncovered by their corresponding slide-ports, so that the bottom spaces of the corresponding cylinders are receiving pressure fluid from the meter chamber.

It will be seen from this arrangement that the action of the meter is as follows: Assuming the position of the slide-valve to be that above described, the fluid pressure in the meter chamber will force downwards the piston of the cylinder that is in communication with the discharge; and the rod of this piston will draw downwards one side of the spherical slide-valve. This, in its turn, will raise up the pistons in the two other cylinders—these pistons being subject to the same pressure above and below, as the inlet-ports are open, and offering little or no resistance to such motion. By the time the first-named piston has arrived at its lowest point, the slide-valve will have closed communication of its cylinder with the discharge, will have opened communication with the meter chamber, and will have (shortly before) established communication between the discharge and one of the other cylinders, the piston of which will by that time have arrived at the upper end of its stroke. The piston of this cylinder will now be forced downward by the fluid pressure in the meter chamber, causing the slide-valve to move over, so as in like manner to cause the third cylinder—when its piston has arrived at the end of its upstroke—to be put into communication with the discharge. This will go on in continuous rotation; the piston of each cylinder, when put into communication with the discharge, being made to actuate the hemispherical slide-valve, so as to control the action of the other two pistons in the manner above described. By this consecutive action of the piston on the slide-valve, this will receive a kind of rolling motion upon the hemispherical head, causing a finger projecting from its centre to describe a conical path round the axial line, whereby it is enabled to rotate a radial arm on a spindle carried in such axial line in the top of the meter chamber, and projecting up into a casing above containing a counter (of any known form) actuated by the revolving spindle, and which registers the consecutive discharges of the contents of each cylinder, which are of a definite capacity. Although the slide-valve has a rolling motion, it has no rotary motion round the axial line; and, in order to insure that it shall be perfectly stationary in this respect, its circular edge is provided with one or more downward projecting studs, which, as the slide-valve rolls, slide in and out of slotted guide-pieces projecting from the pillar head. In order to control the length of the stroke of the pistons, a conical flange or rolling ring is formed on the valve-seat, and a similar one on the valve; and the time of admitting the fluid to the

cylinders, and of exhausting it from them, is so arranged that the two faces are practically always in contact at one side or the other—in fact, they roll on each other; thus giving the arms, and with them the pistons, a definite extent of movement.

Carburetting Water Gas.—Glasgow, A. G., of Westminster Chambers, S.W. No. 24,005; Dec. 11, 1894.

Alluding to his invention, the patentee says: My invention has for its object to secure a better and more economical enrichment of the gas by means of hydrocarbon oils. It has been heretofore recognized that at the temperature which is usually employed in carburetting and fixing chambers, and which is recommended by gas engineers, the oil does not produce a gas of the highest illuminating power which it is capable of producing—some of the oil being converted into lamp-black and gases of low illuminating power. The customary high temperature has, however, been continued in use, because it was on the whole considered most economical; the alternative being assumed to be a loss of oil through but partial fixing, and probable trouble in conduits, &c., owing to condensation of oil therein. The object of my invention is to obtain from the oil a gas of the highest possible illuminating power, without causing any deterioration in the other qualities of the gas or any waste of oil, which I completely utilize.

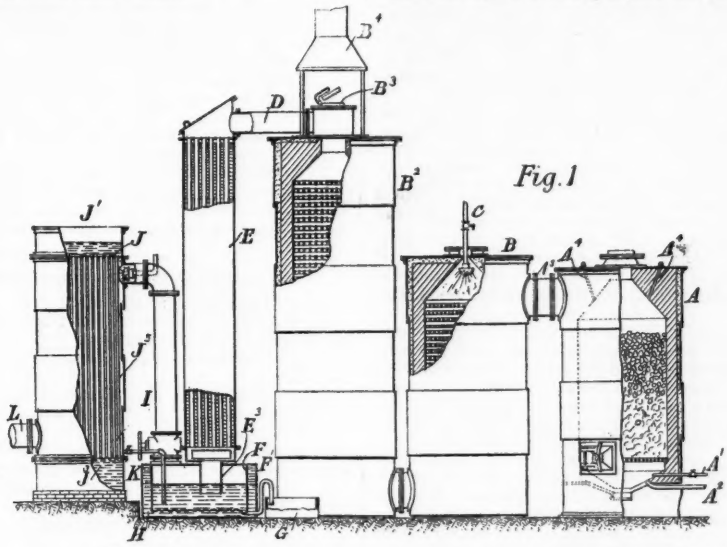


Fig. 1

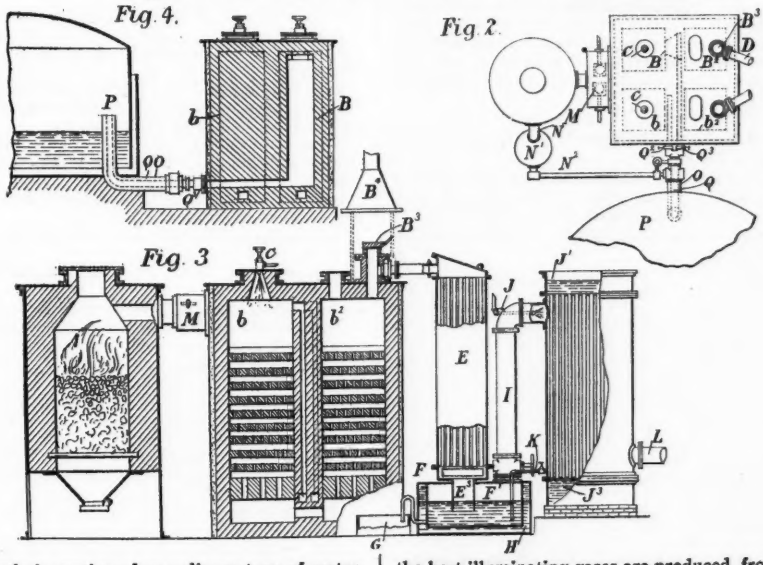


Fig. 1 is an elevation partly in section of an ordinary type of water-gas plant, modified to carry out the present method. Fig. 2 is a plan of apparatus of the constantly carburetting type—such, for instance, as the Collins patent of 1892. Fig. 3 is an elevation (partly in section) of fig. 2, and illustrating how this apparatus can be modified. Fig. 4 is a cross section of fig. 2.

Referring to fig. 1, A is the generator, of the usual construction. A^1 is the steam-pipe leading to its base; and A^2, the blast-pipe. A^3 is the outlet conduit leading from the generator to the carburettor. A^4 are oil-outlets. B B^2 are carburetting and fixing chambers, connected at the base, and filled with checker work. The blast gases from the generator are, as usual, passed through these chambers, preferably ignited therein, and then allowed to escape through a valve B^3 into the stack B^4. The water gas, however, is led off from the chamber through a conduit D. C is an oil-distributer, through which oil is thrown into the carburettor B, when the water gas is passing through it. E is a surface condenser, which forms part of, or is a continuation of, the conduit D; the gases passing through a series of pipes running through a water chamber. F is a liquid seal formed by the tank F^1 and a conduit section E^3, which receives the gases after they have passed from the condenser. It extends down into the tank below the level of the fluid—preferably oil—contained therein, so as to prevent the gases from drawing back if the action of the generator is fluctuating.

The tank F^1 forms part of the gas conduit; and it is continued by the pipe I, which preferably leads into another surface condenser J^1, or into a devaporizing chamber of suitable form. As shown, a series of pipes connect the water chambers J^1 and J^2, passing through the chamber J^3. Thence the gases pass to the conduit continuation L, and so on, to further condensers or cleaners, or to a gasholder.

J is a pipe through which scrubbing oil can be introduced into the top of the condenser or devaporizing chamber. When introduced, it flows down around the pipes in J^3, absorbing the uncondensed vapours present in the gas. K is a pipe which serves to conduct away the oil introduced at J with whatever vapours it may have absorbed. This pipe may lead to any convenient receptacle—in the engraving, it is shown leading into the tank F^1. If oil fresh from the storage tank is used in the condensers as scrubbing oil, the patentee says it is better to collect this separately, and not turn it into the tank F^1. To cool the oil in F^1, it is surrounded by a water jacket H, fitted with an overflow-pipe, into a receptacle at G, from which it may be taken at intervals and reintroduced into the apparatus, as has been explained.

After the fuel is properly ignited, and "the carburetting and fixing chambers heated to a temperature not greatly exceeding that at which the best illuminating gases are produced from the oil," the generator is operated in the well-known way to produce water gas, and oil in proper quantities is introduced into the carburettor, by the distributer C. At the temperature employed, a considerable percentage of the oil, as has been explained, is not converted into a fixed gas, but passes in vaporous form with the gas into the condenser E, where it is wholly or in part condensed, and from which it is collected, as in the tank F^1. The oil so saved is, as has been stated, re-used for carburetting fresh gas; and as it is heavier than the oil originally employed, it is by preference introduced into the generator A. The oil condensed in E may be employed to form a liquid seal in the tank F^1; and it is prevented from revolatilizing by means of the cooling water jacket which surrounds it. After the gas has passed the liquid seal, the patentee prefers to pass it through a second surface condenser or devaporizing chamber; and the oil which is collected in this chamber may or may not, as has been described, flow into the seal chamber F^1 through the pipe K. The scrubbing oil, which enters through the pipe J, if this be used, flows down through the chamber J^3, and carries with it the condensed oil vapour which it has separated from the gas.

If the apparatus shown in fig. 1, and as described, were so operated

as to permit undecomposed steam to escape from the fuel bed, together with the water gas, and if this excess of steam be not decomposed in its further passage through the fixing chambers, its equivalent in water will be collected in the tank F^1 or G, wherein it will separate from the oil, and from which it must be withdrawn at proper intervals.

To obviate any danger of undecomposed steam being carried along with the gas, such an apparatus as is described in Collins's U.S. patent (previously referred to) may be employed; such an apparatus, with certain changes, being capable of carrying out the present proposed method. The modified apparatus is illustrated in figs. 2, 3, and 4.

In these, a receiver is provided, which is connected with the generator by pipes N N^2, which pass through the seal N^1. In operation, the blast gases are passed through flues to a box M. From this box, valves direct them through passages to the carburettor B. The gases then pass to a fixing chamber B^2, and from the chamber *b* through a similar conduit to a corresponding chamber b^2. From the fixing chambers B^2 b^2, the gases escape into a conduit which leads to the condenser E, as shown in fig. 3.

The water gas from the generator escapes through the passage N, seal N^1, and pipe N^2, to the conduit O, which leads to a receiver P, in which the water carried from the generator condenses, and dry gas issues from the receiver through the pipe Q; thence to a two-way connection, one branch of which is governed by the valve Q^2, and the other by the valve Q^3—the one connecting with a flue leading to the carburettor *b*, and the other with a flue leading to the carburettor B.

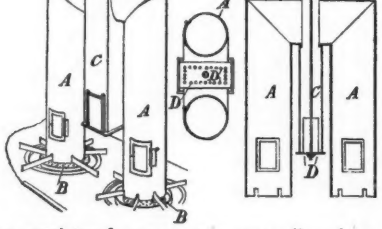
Oil is introduced into the carburettors by the distributors C, and the carburetted water gas escapes through the flue D or the flue *d*, accordingly as the carburettor B or *b* is used, to the condensers E and J, where the subsequent operation is the same as before described.

It will be understood that the carburetting chambers are used alternately; water gas passing through one set of chambers while the other is being heated up by the fuel gas from the generator. But by the interposition of the receiver, the carburetting of water gas is practically continuous; care being taken to shift the valves so that the water gas will not be conducted into the chambers in direct communication with the generator. The only important feature of this apparatus from the standpoint of the present invention is, however (according to the patentee), "the interposition of a receiver between the generator and the carburettor, which, as already stated, effects a drying of the gas, and prevents the admixture of water with the oil vapour collected in the surface condenser."

As to the proper temperature for the carburetting and fixing chambers, the inventor remarks that this will, of course, vary with the kind of oil employed; but the temperature at which the best fixed illuminating gas will be produced from the oil used can in all cases be readily ascertained, and the temperature regulated accordingly. In the case of naphtha of ordinary commercial character, he finds it advisable to decrease the temperature of the fixing chambers by at least 400° Fahr., and preferably considerably more, as compared with the present approved practice in gas making; and with all oils he recommends a decrease of temperature of from 400° to 600° Fahr.; while a decrease of 1000° Fahr. has been found decidedly advantageous in many instances. The rule must be to govern the temperature essentially by the quality of the gas produced, and disregard the amount of oil which is simply vaporized and not reduced to a fixed gas—the economy of his treatment being the result of re-using the condensed oil at a temperature appropriate to its character. Such re-use at the proper temperature results in the complete utilization of the oil to produce gas of the highest value.

Heating Attachments for Gas Cooking-Stoves.—Guy, J., of New York. No. 24,081; Dec. 11, 1894.

The object of this invention is to provide an attachment for ordinary gas cooking-stoves, by the use of which, says the patentee, "a great amount of heat can be economically obtained therefrom, and which may be readily put in place or removed, accordingly as it is desired to use the stove for heating or cooking."



The heater consists of one or more ascending drums or ducts A (the number depending on the number of burners to be utilized for heating purposes) open at their lower ends, and adapted to fit over the burners B, and act as flues therefor. Elbows are formed at the upper ends of the drums, extending horizontally to a central descending box or duct C, with which they communicate. The box is otherwise closed at its upper end. It extends from the elbows downward to a point somewhat above the level of the burners. It is provided with means for limiting the exit of the air therefrom, so as to cause the air and products of combustion, carried up the drums from the burners, to thoroughly heat the drums and box before they escape. Preferably the air openings D are arranged near the side of the box, as shown, so as to cause the heating air to pass down close to the walls and highly heat the box on all sides. There are doors in the drums near their lower ends (in proximity to the burners), through which they may be lighted, and an additional quantity of air admitted to the drums.

At their lower ends, the drums are notched, so as to interlock with the bars of the stove-top, and secure the heater from falling over. A door is formed in the side of the box, whereby the exit of a greater quantity of air may be permitted, and through which such air may be thrown horizontally outward into the room in a strong current.

When in place and in operation, the drums can be heated to cherry redness by the gas ordinarily consumed by cooking-burners; and the air from the drums combining in the box C, the latter is also very highly heated.

Gas-Engines.—Marks, G. C.; a communication from F. Hirsch, of Steinway, N.Y., U.S.A. No. 24,089; Dec. 11, 1894.

This is an improvement on the gas-engine described in patent No. 13,333 of 1894, in which the pistons, connecting-rods, rock shafts, pitmen, and cranks are arranged in a central plane of action, coinciding with that of the longitudinal axis of the power cylinder. A triple-wristed arrangement of cranks is in that case resorted to; one of the pitmen is bifurcated; and the crank webs are counterweighted to balance the extra weight of the bifurcated pitman—all of which renders the parts heavier than is desirable in small engines, especially those designed to be portable.

The present invention consists in an arrangement to obviate these objections, and at the same time simplify and cheapen the construction of the engine as a whole. In doing this, the patentee is enabled to dispense with one wrist-pin and web, with the bifurcation of one pitman, and the counterweighting of the webs to compensate therefor, so as to lighten the engine and attain a more perfect balance of parts, and admit of a higher speed with a given power, as well as simplifying and cheapening the construction, without impairing the advantages attained by the use of opposed cylinders, pistons, &c., arranged in substantially the same plane of action. In the present case, what may be designated as this common plane of action is coincident with the central plane of the comparatively thin web which connects the two cranks and wrist-pins; and the power cylinders are practically one and continuous. Among other important advantages of constructing the cylinders separately, and in joining them by a trunk or section, is that the difficulty and cost of boring the long single cylindrical interior surface is avoided; the parts are interchangeable and easily separated or replaced; and the central section or trunk portion also affords convenient means for arranging and constructing the inlet and discharge valves and passages in a simple and effective manner.

APPLICATIONS FOR LETTERS PATENT.

1914.—Tweedle, J., "Sanitary check-valve for preventing foul air or gases from entering house water-supply pipes and mains when the mains are turned off." Jan. 28.

1922.—Niemczik, A., "Starting gas and petroleum engines." Jan. 28.

1953.—Bullier, L. M., "Carburetting air and gases." Jan. 28.

1961.—Boult, A. J., "Carburettors." A communication from G. Cabrié. Jan. 28.

1972.—Purves, D., and Morton, R., "Gas and air testing apparatus for testing gas, soil, and drain pipes." Jan. 29.

2017.—Pinkney, C. W., "Furnaces for producing gas from carbonaceous matter." Jan. 29.

2025.—Braham, R. W., "Combined gas and electric light standards. Jan. 29.

2046.—Seel, C., "Improved Bunsen burner." Jan. 29.

2063.—Wheatley, W. H., "Hydrocarbon gas generators and burners." A communication from B. A. Beal and C. E. Bonnett. Jan. 29.

2066.—Willatt, J., "Apparatus applicable to gas-burners." Jan. 29.

2078.—Lindley, R. H. N., "Joint-rings for steam, liquids, or gases for pipes, tanks, or boilers." Jan. 30.

2085.—Holmes, J. W. C. and P. F., "Revolving and fixed plates used in scrubbing or washing gas and in the production of chemicals." Jan. 30.

2092.—Cripps, F. S., "Valves for use in connection with purifiers employed in gas-works." Jan. 30.

2099.—Beal, W., "Pendants for gas and other lights and lamps." Jan. 30.

2111.—Green, T. W., "Rotary blowers, exhausters, or pumps." Jan. 30.

2127.—Morgans, W., "Burners for incandescent gas-lamps." Jan. 30.

2151.—Andrew, T., "Mantles for covering the flames of incandescent lights." Jan. 31.

2180.—Ewing, W., and Meikle, J., "Carburetting illuminating gas." Jan. 31.

2188.—Horsfall, R. V., "Distilling, cracking, or gasifying oils, tars, or any liquid hydrocarbons." Jan. 31.

2191.—Duggan, P., "Saturator for the manufacture of sulphate of ammonia from gas ammoniacal liquor." Jan. 31.

2207.—Petrie, D. W., "Burner regulator for gas cooking-stoves and the like." Jan. 31.

2213.—Richardson, J. C., "Production of oxygen or hydrogen gas." Jan. 31.

2224.—Moeller, J., "Illuminant appliances for incandescence gas-lights." Jan. 31.

2267.—Syer, M., "Valve for liquids, gas, and other purposes." Feb. 1.

2327.—Clarke, T. A. W., "Gas and oil motor valve motion." Feb. 2.

2347.—Greifenberg, W., "Steam, gas, or other rotary engines." Feb. 2.

Ossett Tradesmen's Association and Gas Supply.—The annual meeting of the Ossett Tradesmen's Association was held last Wednesday; and the members considered the question of the price and quality of the gas supplied by the local Company. Several speakers referred to the addition made to the charge at the time of the coal struggle in 1893, and complained that the Directors had been guilty of a breach of faith in not removing it now that the circumstances had altered. The present charge for gas was denounced as extortionate. It was decided to convene a meeting of tradesmen and others in Ossett and Horbury, to consider the propriety of issuing voting-papers to the consumers, in order to elicit their feeling upon the question. Suggestions were made during the meeting as to the advisability of the Ossett Corporation purchasing the gas-works, or of inviting an electric lighting company to commence operations in the district.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

The Proposed Conversion of South Metropolitan Gas Stock.

SIR,—I have been studying the South Metropolitan Gas Company's circular of the 30th ult. to holders of "A" and "B" stock. As a holder of "B" stock, it appears to me that the terms of the proposed commutation benefit the "A" stock at the expense of the "B" stock.

It is true that, if the present dividend of 13 per cent. on the "C" stock is maintained, there will be a slight advantage to the "B" stock; but, on the other hand, should there be a fall in the dividend—and Parliament is likely to exact some ransom for passing the Bill—the "A" stock will gain by the conversion, and the "B" stock will lose.

At present, up to 11 per cent., the "A," "B," and "C" stocks receive the same rate of dividend; but, under the proposed commutation at 11 per cent. on the old stock (equal to 5½ per cent. on the new stock), the rate of dividend on the three present stocks will be—

	A.	B.	C.
Present stock	£100	£100	£100
Proposed amount of new stock	£237½	£186	£200
Dividend on new stock, 5½ per cent.			
Dividend on £100 of original stock	£13·03	£10·23	£11

The proposed commutation will, therefore, give the holders of the "A" stock a more uniform dividend, whilst the dividend on the "B" stock (now the most regular) will be rendered less uniform and less valuable.

This fact will be confirmed by looking at the proposed conversion from another point of view—viz., market price. The new stock will be "C" stock split in two. Taking the market price of the "C" stock, as recorded in the JOURNAL for the 5th inst., at £310, then £100 of the new stock will be worth £155. £100 of the "A" stock is to be exchanged for £237½ of the new stock, the market value of which should be—

$\frac{237\frac{1}{2} \times 155}{100}$	= £368
Present value of "A" stock	345
Gain to "A" shareholders	£23

On the other hand, £100 of the "B" stock is to be exchanged for £186 of the new stock, the market value of which should be—

$\frac{186 \times 155}{100}$	= £288¾
Present market value of "B" stock	297½
Loss to "B" shareholders on the proposed conversion	£9¼

I shall be glad if you can find a place for this letter in your columns, as conversion schemes of this character are frequently only glanced at by shareholders. I cannot but think that, if the "B" shareholders were aware of the effect of the proposed commutation, they would ask the Directors to reconsider their scheme.

Kent Water-Works, Deptford, Feb. 8, 1895. W. MORRIS.

The Efficiency of Luminous Combustion.

SIR,—Having of late been giving a considerable amount of consideration to the causes affecting the enrichment of coal gas by means of various hydrocarbons, and consequently the conditions affecting the luminosity of hydrocarbon flames, I read with intense interest the article communicated by Professor Harold B. Dixon, on "The Efficiency of Luminous Combustion," which appeared in your issue for the 29th ult. I had previously also read the article by Mr. B. H. Thwaite "On the Efficiency of Non-Luminous Combustion of Coal Gas in Welsbach Burners," as compared with the ordinary luminous combustion, and which appeared in your issue for the 8th ult., and which Professor Dixon apologetically states he used as a peg on which to hang his confession.

I fully agree with Professor Dixon in his criticism of Mr. Thwaite's article as to the error committed in attributing equal heating effect to the same weight of carbon and hydrogen, whether in a free state or in combination, and also the premisses on which he builds his ultimate results in as far as Mr. Thwaite estimates the illuminating power obtainable from a gas consumed as a luminous flame, by taking the total heat given out by the combustion of the hydrogen in the constitution of the gas as all that is available for producing light in a luminous flame by heating the carbon to incandescence. I should even be inclined to go further, and say that, if it is true that carbon and hydrogen give out different heating effects dependent upon whether they are in the elementary state or in combination as hydrocarbons, or as carbon partially burned in the form of carbonic oxide, it holds true to an infinitely greater extent to their luminosity during combustion.

Mr. Thwaite takes it for granted that the chemical affinity of the hydrogen for oxygen over the carbon will be so great that, whatever may be the constitution of the hydrocarbon compound, the oxygen will first combine with the hydrogen and set the carbon free, to be for a time heated up to incandescence by the heat resulting from the combustion of the hydrogen. It is well known that the percentage of carbon and hydrogen present in a gas is no measure of the possible luminosity obtainable from it when consumed. Thus marsh gas will only give a feebly luminous flame; whilst a gas composed of free hydrogen and ethylene, containing the same percentage of hydrogen and carbon, if burned at the same rate, would give an intensely luminous flame, whilst the difference in heating effect would be comparatively trifling.

Although, however, I am so far in accord with Professor Dixon's views regarding Mr. Thwaite's article, I am by no means satisfied that the experimental evidence adduced by the Professor proves that when a hydrocarbon burns with a luminous flame the hydrogen in the hydrocarbon does not burn first.

The Professor says that his conversion from the view held by Mr. Thwaite regarding the nature of the combustion taking place in a luminous hydrocarbon flame came about through his observing that, when on firing a mixture of equal volumes of ethylene and oxygen, he found as the result of the explosion that the hydrogen was not burned selectively—that there was not even a division of the oxygen between the hydrogen and the carbon, but that the latter seized all the oxygen, and the hydrogen got none; also that the same was found to occur in the explosion of other hydrocarbons. Reference is then made to the fact that similar results had been obtained by others—viz., John Dalton, Dr. John Davy, and Kerston, the latter of whom states that the separation of carbon in a flame was due simply to the decomposition of the hydrocarbon by heat.

Then, again, with regard to the more gradual combustion of a hydrocarbon in a flame, the Professor refers to the experiments made by Professor Smithells, as showing that the same preferential combustion of carbon takes place. By dividing the two cones of the Bunsen flame fed with a mixture of a hydrocarbon and air, he is enabled to draw off and analyze the products of complete combustion taking place in the inner cone; and he found that, while the carbon is all converted into carbonic oxide and carbonic acid, the hydrogen is only partially burned to steam—the rest being liberated.

Professor Dixon admits that, although the results have converted him, they yet do not absolutely prove that the carbon is burned first—that it is possible to conceive that the hydrogen burns first, and then is immediately deprived of its oxygen by the carbon. To this view the Professor objects, "Why, if hydrogen is so active at first, does it not succeed in retaining some of the oxygen it has seized?" And again, "When steam is passed over heated carbon, the carbon takes oxygen from the steam to form carbonic oxide. If *solid* carbon is thus superior in its affinity for oxygen, *à fortiori* gaseous carbon should be superior to hydrogen."

To my mind, this latter evidence against the prior combustion of hydrogen is the best it was possible to produce in support of the theory that the results obtained under the conditions in which the hydrocarbon was burned in the experiments referred to, was by the prior combustion of the hydrogen; and I may at once say that (although I may be wrong) at present I am under the impression that the carbon of a hydrocarbon can only be burned, as it were, through the hydrogen or by the previous severance of the hydrogen from the carbon by decomposition.

When steam is brought into contact with heated carbon, carbonic oxide is not necessarily formed. It altogether depends upon the temperature and the relative proportions of the carbon and the steam, what are the resulting products of the reaction—simply because these conditions modify the relative affinities of the carbon and the hydrogen. Whatever the temperature may be, however, carbonic acid is invariably first produced; and if the temperature to which the carbon is heated be very low, and the steam is in excess, carbonic acid and hydrogen (with mere traces of carbonic oxide) are the resulting products. As the temperature of the carbon is raised, its affinity for oxygen gradually increases; and if the supply of steam is limited, the carbonic acid that is first formed is further and further reduced to carbonic oxide, till at very high temperature the sole products are carbonic oxide and hydrogen.

It may be well also to take note of the fact that gaseous carbon does not necessarily have a higher affinity for oxygen than solid carbon. The relative affinities depend upon a variety of circumstances. The affinity of oxygen for solid carbon is very much modified by its condition in the free state—for instance, in the state of finely powdered wood charcoal; and, again, as graphite or black lead. The one form of carbon will ignite in air several hundred degrees below the other. Then, again, take gaseous carbon as associated in marsh gas and as acetylene. How the altered conditions in which the gaseous carbon is linked to the hydrogen influence the affinity of oxygen for the carbon contained in those gases. It may be also mentioned that wood charcoal will ignite and burn at a temperature that will fail to ignite marsh gas.

To return to the evidence of the experiment. When equal volumes of ethylene and oxygen are exploded at constant volumes, the temperature produced is exceedingly high; and at such high temperature, it is an undisputed fact that carbon has the superior affinity for oxygen over hydrogen. It would therefore be surprising if the result of the explosion should be anything else than that found; for even allowing that the hydrogen was burned first (which I believe to be the case), the water so formed would be instantly decomposed by the intensely heated liberated carbon to carbonic oxide and hydrogen. The extremely high temperature, the exceedingly high rate of combustion, and cooling would ensure the results obtained.

In the experiments made by Professor Smithells, air was used instead of pure oxygen; and the combustion of the hydrogen took place slower and under constant pressure—all conditions leading to a lowering of the temperature during combustion. Under these modified conditions, the results obtained are in perfect harmony with the results that might have been anticipated from the relative affinities of carbon and hydrogen as ascertained from bringing steam and heated carbon into contact. The temperature of combustion is much lower than during the period of explosion with oxygen. The affinities are modified accordingly; and instead of getting carbonic oxide and hydrogen as the sole result, we have the oxygen divided between the carbon and the hydrogen as under:—

Analysis of Interconal Gases from a Coal Gas Air-Flame.

	Per Cent	
Carbon monoxide	8·7	17·9 p. ct. combustible gases.
Hydrogen	9·2	
Carbon dioxide	4·1	20·1 p. ct. burnt gases.
Water	16·0	
Nitrogen	62·0	
	100·00	

These results are substantially identical with those that would be obtained by bringing steam into contact with carbon at a moderate temperature; and it appears to me to bear strong evidence that, when a hydrocarbon is burned under conditions similar to those referred to —where the oxygen and the hydrocarbon are brought into intimate

contact—combustion takes place through the hydrogen first uniting with the oxygen; the oxygen in turn being taken from the hydrogen by the carbon to an extent dependent upon the temperature to which the carbon is raised during the process of combustion.

Whilst, however, questioning the experimental evidence adduced as proving the correctness of Professor Dixon's views in those respects, I have no desire that he should imagine that I believe the luminosity of a hydrocarbon flame is due to the selective affinity of the hydrogen combined in the hydrocarbon for oxygen leading to its severance from the hydrocarbon, and by its selective combustion supplying the heat necessary to heat up the liberated carbon to luminous incandescence. I do, however, believe that the luminosity of an ordinary hydrocarbon flame is largely due to the combustion of the hydrogen necessarily preceding, to a large extent, the combustion of the carbon; and that the conditions obtaining during the combustion of a hydrocarbon in an ordinary luminous flame are such as influence the relative affinities of the carbon and hydrogen for oxygen to bring about the resulting luminosity.

An analysis of the gases drawn from progressive stages during the combustion of a luminous hydrocarbon flame, indicates that different hydrocarbons undergo very different changes during their combustion; but with all hydrocarbons, at the commencement of the combustion, both the carbon and the hydrogen of the hydrocarbon are consumed till the temperature of the flame reaches that at which the particular hydrocarbon being consumed begins to be decomposed. At this stage, the combustion ceases to be indiscriminate; the conditions being such that the hydrogen set free has the larger affinity for the oxygen, and is to a larger extent consumed than at the earlier stages. The resulting heat is largely devoted to still further decompose and change the remaining hydrocarbon; the process being continued, and the hydrogen being further and further severed from the hydrocarbon, and (from its greater rate of diffusion) passing to the outsides of the flame accompanied by a small quantity of the hydrocarbon. Being here consumed, the watery vapour and carbonic acid so formed mostly pass away to the surrounding atmosphere, and are thus to a large extent prevented from reacting upon the remaining dense hydrocarbon vapour and free carbon. They yet supply the heat necessary to continue the decomposition of the remaining hydrocarbon; the flame becoming more and more luminous, and the luminosity being sustained by the final combustion of the dense hydrocarbon and carbon, till all are converted into carbonic acid and watery vapour.

With a compound gas such as coal gas, the superior affinity of the free hydrogen over the hydrocarbon in a luminous flame is still more manifest, as from the commencement of the combustion the percentage of hydrogen in the flame is rapidly reduced, whilst the hydrocarbon remains comparatively unconsumed, and nearly all undergoes decomposition before combustion.

As is well known, the flame of a hydrocarbon has the highest illuminating power when it is just on the point of smoking—a condition obtained when the relative affinities of the carbon and hydrogen present in a flame are so balanced that the heating power of the hydrogen and a portion of the hydrocarbon are as far as possible devoted first to the decomposing of the hydrocarbon and raising to incandescence the products of decomposition, and thereafter continuing the luminosity by complete combustion of the products of decomposition.

If carbon had the higher affinity for oxygen over hydrogen under the conditions obtained in a luminous flame, it would be impossible to make a flame smoke without at the same time being accompanied by free hydrogen. We know such is not the case.

Further evidence of the influence of temperature in modifying the relative affinities of carbon and hydrogen is supplied in the manufacture of lamp-black from a hydrocarbon where the hydrogen is burned out of the hydrocarbon at low temperatures, and the secondary reaction of the watery vapour produced on the carbon reduced to a minimum.

Whether, therefore, a hydrocarbon is burned with explosive rapidity or more slowly as in a Bunsen flame (as in Professor Smithells' experiments with a limited supply of oxygen), it appears to me that, before the oxygen can get to the carbon, it must do so by first burning the hydrogen into water. The oxygen in turn passes from the water to the carbon, with the formation of carbonic oxide and hydrogen or carbonic oxide, carbonic acid, and water; and that the relative proportions of these products of partial combustion are entirely dependent upon the temperature reached during the period of combustion. If the temperature be sufficiently high, the superior affinity of the carbon at high temperatures will completely deoxidize the water first formed, and the sole product will be carbonic oxide and hydrogen. At lower temperatures, the affinities of the carbon being not so great, it fails to reduce the water first formed. But not only so, the carbonic acid first formed from the water is only partially reduced to carbonic oxide; and therefore the products are carbonic acid, carbonic oxide, and water vapour, varying with the temperature of combustion.

When, on the other hand, a hydrocarbon is burned so as to produce a luminous flame, the oxygen only gets at the carbon through its hydrogen, after it has undergone more or less decomposition. That portion of the hydrocarbon consumed prior to the temperature of the flame reaching the point at which decomposition of the hydrocarbon takes place, as well as the portion of the undecomposed hydrocarbon accompanying the liberated hydrogen to the outside of the flame, are consumed under conditions similar to those obtaining in the Bunsen flame without luminous effect; and it is only the portion undergoing (or which has undergone) decomposition which produces luminosity—first by being heated for a time to incandescence, and afterwards by its own combustion.

Peebles, Feb. 7, 1895. WM. YOUNG.

The Relative Efficiencies of Acetylene and Other Artificial Illuminants.

We have received from Mr. Frank Wright a letter on the above subject, in answer to that of Mr. Denny Lane in our last issue (p. 269). It unfortunately did not reach us till too late for insertion in the present number; but it will appear next week.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The Fourth Session of the Twenty-fifth Parliament of the United Kingdom was opened last Tuesday by Commission. Among the business disposed of during the week was, as usual, the determination of the House in which the respective Private Bills should be first considered. This was the result of a conference between the Chairman of Ways and Means (Mr. Mellor) and the Chairman of Committees of the House of Lords (the Earl of Morley), at which it was decided that the following Bills, in which our readers are interested, should originate in the Upper House:—

Ambleside Local Board Gas and Water Bill, Barnsley Corporation Water Bill, Bristol Water Bill, Chesterfield Gas and Water Board Bill, Dewsbury and Heckmondwike Water Bill, Edinburgh and District Water Bill, Felixstowe and Walton Water Bill, Hebden Bridge and Mytholmroyd Gas Board Bill, Hebden Bridge Local Board Gas Bill, Ilfracombe Gas Bill, Merthyr Tydfil Local Board Water Bill, and Rotherham Corporation Bill.

The Standing Orders have been complied with in respect of the petitions for all the foregoing Bills, with the exception of that for the Rotherham Bill.

The following Bills relating to gas and water supply will originate in the House of Commons:—

Aberdeen Harbour Bill, Bray, &c., Water Bill, Bridlington and Quay Water Bill, Brighouse Corporation Bill, British Gas Light Company (Staffordshire Potteries) Bill, Brymbo Water Bill, Chelsea Water Bill, Clonmel Corporation Bill, Cranbrook District Water Bill, Croydon Corporation Bill, Dublin Corporation Bill, Hayward's Heath Gas Bill, Kingston-upon-Hull Corporation, Lambeth Water Bill, London Water-Works Transfer Bills (eight), Newmarket Gas Bill, North Middlesex Gas Bill, Scarborough Gas Bill, South Metropolitan Gas Bill, Whitby Water Bill, and York New Water Bill.

The following were among the Public Bills introduced and read the first time last week: Boards of Conciliation Bill, Factory and Workshop Act (1891) Amendment Bill, Rating of Machinery Bill, Rivers Pollution Prevention Bill, Trade Disputes (Conciliation and Arbitration) Bill, and Workmen's Accidents (Compensation) Bill.

Among the first notices of questions were two, by Mr. J. Howard (Tottenham) and Mr. J. Rowlands (East Finsbury) respectively, as to the recent explosions in electric light street-boxes; and on Thursday they were answered by the President of the Board of Trade (Mr. Bryce). He stated that inquiries had been held into the causes of the explosions; and the reports should be laid upon the table. The electric lighting regulations of the Board for securing the safety of the public provided that all street-boxes should be efficiently protected against any accumulation of gas or water; and the Board were earnestly pressing upon electric lighting companies the necessity for full compliance with these regulations. He added that it was most desirable that the gas companies should adopt the best means at their disposal to detect and remedy any defects in their mains; and he stated that he was taking steps to call their attention to the matter.

LEGAL INTELLIGENCE.

The Kent Water Company and Troublesome Consumers.

At the Greenwich Police Court last Tuesday, before Mr. Kennedy, Mrs. Ellen Baker, of 10, Mount Pleasant Road, Lewisham, was summoned by the Lewisham Board of Works for having her house without a proper and efficient supply of water. Mr. Young appeared for the Board; and Mr. Pridham defended. Mr. Pridham said that when the case was previously before the Court, he stated that it was impossible for Mrs. Baker to comply with an order, and that the offence was not her act, as the Kent Water Company had cut off the supply of water. Mr. Young, for the Board, said it could not be asserted that the nuisance which existed at Mrs. Baker's house through not having a proper supply of water was caused by the Company. Mrs. Baker had her remedy in the matter. She could have paid the money, and then sued the Company for its recovery, or have left the house. Mr. Pridham submitted that it was the fault of the Company, who, he said, had been offered the money twelve days before the date named in the summons. He was willing to pay the amount due to the Company; and if they put on the water the cause for the Board's summons would be removed. Mr. A. Dickson, the Company's Secretary, said that if the money was paid the water could be put on the next day. Mr. Young asked for the prohibition order, as a house was not in a sanitary condition without a proper supply of water. Mr. Pridham suggested an adjournment for a few days. Mr. Kennedy adjourned the summons for the money to be paid, and the water to be laid on. His Worship added that these poor people had suffered enough, and he would not make the prohibition order asked for by the Board of Works. Mrs. Baker was also summoned for £1 16s., three quarters' water-rate to Christmas last, and 3s. the cost of the summons. Mr. Dickson supported the summons, and evidence was called to show that the usual demands for payment had been made. The money had not been paid; and the Company cut off the supply. Mrs. Baker's son was called, and he said he tendered payment for the amount claimed on the 12th of January. Witness said this was refused, as only the actual debt was tendered, and another quarter had been entered upon. Mr. Kennedy said he considered the Company had acted in a very high-handed manner, and the summons would be dismissed with £5 5s. costs. There was also a summons against Mrs. Baker's husband for 12s. water-rate in respect of No. 6, Mount Pleasant Road. Mr. Kennedy made an order for payment, with 3s. costs.

Ballance v. The Belfast Water Commissioners.

This case was originally tried at the Belfast Spring Assizes last year, when Mr. Justice Holmes directed a verdict for the plaintiff, which was subsequently set aside by the Exchequer Division. The matter was then carried to the Court of Appeal of the High Court of Justice, Ireland; and the Lord Chancellor, the Lord Chief Justice, and Lords Justices Fitzgibbon and Barry, commenced hearing the arguments of Counsel on the 17th ult. The action had been brought to recover £221, the price of certain minerals which the Commissioners had taken from the plaintiff's holding for the purposes of their new works at Stoneyford. By an agreement dated Dec. 23, 1890, plaintiff gave the Commissioners liberty to enter upon, raise, and take away stones from his holding at Ballypitmave. At that time plaintiff was a judicial tenant of the holding under Lady Wallace, and had no interest in the minerals. He subsequently purchased his holding under the Land Purchase Acts, under an agreement dated February, 1891, after which date the Commissioners had removed from the holding the admitted value of the amount claimed. The Commissioners argued that, by the agreement, they were entitled to the stones which the plaintiff subsequently acquired by virtue of his purchase under the Land Acts. On the other hand, plaintiff contended that, by the agreement, he had given to the Commissioners liberty to use the surface of the soil only; and they were bound to pay for the stones in addition, as they would have been bound to pay Lady Wallace if he had not bought the holding under the Land Purchase Acts. The arguments of Counsel were continued on the 18th and 21st ult.; and the case was then adjourned to last Wednesday, on which day judgment was delivered. The Lord Chancellor said that the case must turn upon the true construction of the agreement of December, 1890. At that time Ballance, as tenant of the holding from which the stones were taken, had a limited interest in the stones, and a right to prevent anyone from removing them except his landlord, who had certain rights reserved to him by the Land Acts. The words of the agreement were suitable and apposite for granting to the defendants their interest; and in his view nothing more than this interest passed under the agreement. The subsequent interest in the minerals acquired by Ballance did not go to feed the grant already made by him; for the words of the agreement, though sufficient to pass the fee-simple in the stones if Ballance had had it at the time the agreement was entered into, could not in law be held to pass an interest subsequently acquired. If Ballance had had no interest whatever in the stones at the date of the agreement, then, having subsequently acquired an interest, he would have been bound to give this interest over to the defendants; but having had the tenant's interest in the stones at the date of the agreement, and the words of the agreement being apposite to pass this, and containing no reference to an intention by Ballance to afterwards acquire the fee, he (the Lord Chancellor) held that this tenant's interest of Ballance alone passed under the agreement to the defendants, who must therefore pay for the stones, which became the property of Ballance after the agreement was entered into. The Lord Chief Justice and Lords Justices Fitzgibbon and Barry concurred. A verdict was accordingly entered for the plaintiff for the sum of £221, with all costs of the original hearing, arguments, and appeal.

A Claim against the Northampton Corporation Water Department.—The Water Committee of the Northampton Town Council have received a notice from Lord Spencer claiming £1292 16s. 11d. as compensation for alleged injuries to lands and hereditaments in the parishes of Church and Chapel Brampton, arising from the construction of the Corporation reservoir at Ravensthorpe. The Committee have had power delegated to them by the Council to negotiate the claim upon what they consider reasonable terms.

Gas Consumption in Belfast.—The quantity of gas sent out from the Belfast Corporation Gas-Works during the six months ending December last amounted to 599,454,000 cubic feet. In the corresponding period of 1893, it was 574,906,000 cubic feet; showing an increase of 24,548,000 feet. This must not, however, be taken as showing an augmentation in the demand, inasmuch as, owing to reduced pressure necessitated by scarcity of coal during the strike, there was a decrease in the second half of 1893 of 28,561,000 cubic feet on the corresponding period of 1892; while the output for the past half year is less by 4,013,000 cubic feet than in the December half of 1892.

Felixstowe District Council and the Gas Company.—The Felixstowe District Council last week approved of a statement of objections to, and observations upon, the Gas Company's Provisional Order, which has been forwarded to the Board of Trade on their behalf. It comprised the following: Better provision for making good the roads opened; reduction of the standard price; the amount of capital, which is regarded as excessive; limiting of all dividends to 7 per cent.; the quality of the gas; and protesting against the working up of pitch and other residuals. By the advice of the Clerk, the Council also agreed to ask the Board of Trade to permit them to be heard in respect of the Order, so that they might be in a position to buy the concern at some future date if they wished.

Sales of Shares.—A number of shares in the *Portsmouth Water Company* were recently sold by auction at Southsea, at the following prices: £5 (1861 issue) shares, £14 10s. and £14 5s.; £5 shares (1879 issue, paying 7 per cent.), £10 2s. 6d.; and £5 shares (1883 issue, £4 paid), £8 12s. 6d.——The *Harrogate Gas Company* have lately sold by tender £5000 of 5 per cent. perpetual debenture stock. The total realization was £7626 5s., with prices at from £152 to £154 5s., or an average of £152 10s. 6d. per cent.——At the Mart, Tokenhouse Yard, E.C., last Wednesday, Messrs. Edwin Fox and Bousfield sold £50 of 6 per cent. second mortgage debentures of the *Cape Town and District Gas Company* for £53 5s.——At a sale of stock of the *Sandbach Gas Company* last Thursday, £46 of original stock, on which a dividend of 7 per cent. was originally paid, realized £84; and £100 of new stock, on which a dividend of £4 18s. had been paid, fetched £126.——At Maidstone, on the same day, five original shares in the *Maidstone Water Company* realized £31 each; and 15 £10 ordinary 10 per cent. shares averaged £30 apiece.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

The Half-Yearly General Meeting of this Company was held at the Chief Office, Horseferry Road, Westminster, last Friday—Colonel MAKINS (the Governor) in the chair.

The SECRETARY and GENERAL MANAGER (Mr. J. W. Field) having read the notice calling the meeting, the report of the Directors, with the accounts for the half year ending Dec. 31 last, given in the JOURNAL last week, was taken as read.

The GOVERNOR, in moving the adoption of the report and accounts, said he would, as usual, deal in the first place with the capital account, from which the proprietors would find that, during the half year they had expended the sum of £99,819, less some credits in respect of the sale of land and of dead capital for works put out of action, amounting to £18,284; leaving the net charge to capital at £81,535. He would not go fully into the details of this expenditure, because there were a very large number of items making up the amount. But at least £50,000 had been spent on labour-saving apparatus; so that revenue would get the benefit of the outlay. The balance had been expended on ordinary plant, mains, meters, &c. The capital per ton of coal was now £6 7s. 10d., against £6 8s. 5d. in the corresponding period of the previous year; so that, in spite of the bright weather which made their load factor last half year very heavy, the capital per ton of coal was still on the down grade. He hoped it would continue so; and he had every reason to believe that it would. With respect to further capital outlay, for the present year the amount would not be nearly so large. He supposed that during this half year from £30,000 to £40,000 might be spent on works already sanctioned; and a further amount—not very excessive—on extra works to be undertaken, but not yet sanctioned. In that case also a very large portion of the capital account would be expended on labour-saving appliances. With respect to the gas-rental, the reduction of £72,152 was accounted for by the decrease in the price of gas from 3s. 1d. to 2s. 10d. per 1000 cubic feet. This had cost the Company £76,702 during the half year; and this sum would have been all against them had it not been for the small increase in the quantity of gas sold, representing an advance in the consumption of 0·33 per cent., or £4550; thus giving the net figure of reduction as £72,150 for the half year. That there was still an increase in the demand for gas was shown by the fact that in those months of the past half year when the weather was normal, there was the satisfactory increase of 4¾ per cent.; and it was only in consequence of the considerable rise in temperature which was experienced in November and December that the consumption fell off. Out of the increased quantity delivered to Oct. 31, which amounted to 219 millions, November and December absorbed 189 millions, in consequence of the extraordinary character of the weather; and it left them with an increase of only 0·33 per cent., or 30 millions, or £4550. It was rather interesting to look in another way at the result of the mild weather referred to. It involved the Company in a loss of rental of £55,000; but if they considered the matter from the consumers' point of view, it resulted in a saving to them, owing to the fogless and mild autumn, of 1½d. per 1000 cubic feet of gas burnt. A further indication of the satisfactory progress of their business was in the department of the supply of stoves. The continual increase of revenue from the hire of gas-stoves since 1889 was shown by the fact that in that year the rental was only £5860, whereas in the year 1894 it was £18,872, or about three times the amount. But this was not the full measure of the increase; because, although the rental had risen threefold, the profit on the estimated quantity of gas sold through the stoves had gone up tenfold, and formed a very important source of revenue for the Company. He thought the proprietors might feel certain that this class of business would continue to increase. He happened to have some evidence from another source, quite apart from the Company, which seemed to point in the same direction. In the case of the Railway Company of which he was Deputy-Chairman—the Great Eastern Company—he knew that in Norwich and Ipswich the increase in the number of stoves was so great as materially to affect the carriage of coal. The coal that used to be made into gas came by water, but that burnt in the fireplaces of the consumers came by rail; and there had been a reduction in the carriage of the latter class of coal. This was conclusive evidence that their Company might look also to an increase of the same kind in their district. With respect to coke, although the price obtained for it per ton had not been quite so high as in 1893, when the Yorkshire coal strike brought about a special demand for coke, the return before them was better than that of 1893, owing to increased economy in the use of coke as fuel at the Company's works—the result of the improved systems of furnaces they had been introducing. As regarded tar and products from tar, the market had been improving, especially in the item of pitch. For a short time this article reached the price of 40s. per ton; and as the Company made 60,000 tons of this product yearly, the increased price in the past six months had brought in very nearly the £19,000, which was shown in the accounts as the increase from tar and tar products. On the other hand, the sulphate of ammonia market had been unsatisfactory, and in a very abnormal condition. Up to August the price was very good, though not the highest they had had. Still, very good and satisfactory prices existed up to August. But after that month the market suddenly collapsed; and they could only attribute this fact to the very depressed condition of the agricultural industry—owing to the low price of wheat, which was lower, perhaps, than it had ever been before—preventing the farmers having money in hand to purchase artificial manures. Within a short period, the market had slightly improved; but it was still unsteady, although they looked for better prices than had been ruling in the last three months. Though the price they had paid for their common coal was higher than in December, 1893, in consequence of the action of the Coalowners' Federation, to which he referred last year, the total cost of coal (including both carriage and enriching material) was slightly lower. This result was

due to some extent to the mildness of the winter months, which had enabled the Company to supply gas of the high quality they were compelled to deliver without using so much of the expensive enriching material; and there had also been a slight reduction in the price of oil and spirit, which were now very largely used instead of the expensive cannel coal formerly employed for the enrichment of gas. Speaking of gas enrichment, he had no doubt that many who were interested in gas had read about the subject of acetylene and carbide of calcium introduced into a lecture delivered by Professor Lewes at the Society of Arts. It was too early to speak about this yet. It was a very remarkable discovery; and it might, like many other remarkable discoveries, be only of value in the laboratory. If it should turn out that it could be produced cheaply, and could be used for enriching gas, it would be another thing to the benefit of the Company. On the other hand, if it did not prove a success in this direction, it did not hurt the Company. Carbonizing wages were slightly better than they appeared in the previous accounts; for, owing to the increasing use of machinery in the retort-house, there had been a steady reduction in actual carbonizing wages from 3s. 3·90d. per ton in 1890, to 3s. 2·40d. in 1894. There were other classes of wages included in this item—such as gatekeepers, timekeepers, storekeepers, valvemen, &c.; but these were rather in the nature of fixed charges, and were not capable of much reduction. They had, too, tended to increase the rate per ton of coal during the recent period of decreasing sales of gas. In consequence, however, of the very large increase they were now experiencing in their sales of gas, that feature would probably appear better in the current half year. Speaking of carbonizing wages, he would like to refer to the question of labour. He was happy to say that their relations with their workmen were of the best possible kind. Everything was going on satisfactorily; and he believed that this was attributable to the fact of their men knowing that the desire of the Company was to treat them justly and fairly. They offered a service which was very popular. The conditions of the service were not at all arduous; and the employment was certain. It also carried with it a great many advantages in the shape of good houses, rooms for indoor recreation in the winter, cricket fields for outdoor recreation in the summer, sick funds, good holidays with full pay, and superannuation funds when the men were no longer able to work. He believed the men were fully alive to the advantages which the Company held out; and this probably accounted for the happy state of things which existed between them and their workmen. He was not one of those who believed very much in the policy of putting labour into leading strings. He thought, with the Chairman of the Great Eastern Railway Company, that an adult mechanic who was considered by the Legislature to be a fit and proper person to sit on a Parish Council or County Council was perfectly able to manage his private affairs in his own way, without too much interference or patronage from his employers. He (Colonel Makins) was not, he hoped, going to introduce any controversial question; but they had not in their Company a profit-sharing scheme. He had no doubt whatever that this was a very excellent thing; and he did not say a word in disparagement of it. But they had not been asked by their men to grant it; and they would not think of tendering it to, or forcing it upon, them. If they were asked by their men to adopt the scheme, they might be prepared, on conditions, to grant it; but in that case it would be necessary for them to consider a readjustment of their labour rates, so as to bring them into the same relation with those paid by companies where profit-sharing schemes were in existence. With regard to wear and tear—amounting to £162,000, as compared with £175,000 in December, 1893—the latter figure included some special payments for reconstruction work which they had now got rid of. As regarded distribution, he might say that they showed the usual results. There was a slight increase in the lighting of "small dwellings," an augmentation of 121 in the number of gas-engines, and an increase of 2338 in meters and of 18,314 in lights. Their gas-stoves on hire had risen by 3361 in the half year; and during that time, they had sold outright to consumers 1522 stoves. With respect to the question of stoves, he did not know whether any of the shareholders present resided in the neighbourhood of Kensington. If they did, they might have seen that the Company had established in the High Street—not far from the church and the station—a very handsome office and depôt for the sale of stoves. This had been rather a costly enterprise; and the Directors regarded it somewhat in the light of an advertisement. But he was happy to say that, apart from the question of advertisement, although the office had only been opened a very few weeks, the takings had been upwards of £7700 between the 1st of January and the 6th inst. He had been informed that day by the chief of the office that there was a wonderful difference in having the stoves there, in good, airy, handsome premises, where the consumer could go and see them alight, and could buy them and take them home—figuratively speaking—or have them sent home, instead of going to a small office where he was shown a picture of a stove, and perhaps one or two specimens, and then had to write to the Company for the one he required. The consumer had not time to "sleep on the matter;" but when he saw the stoves, and the pattern he wanted, he ordered it. Although they were a little staggered at first in connection with the outlay in opening this establishment, they believed that it would turn out profitably. With reference to automatic meter supplies, the number they had at present in use was nearly 1500, besides between 1900 and 2000 applications; and there were also 804 cookers in use. Of all the automatic meters they had fixed, not one had been discontinued. They had been somewhat delayed in this matter, in connection with which they were prepared to make a greater advance. He thought they might congratulate and compliment their friends, the South Metropolitan Company, and the Chairman of that Company on the enormous success which they had had in inaugurating this business. They had themselves followed at a respectful distance—perhaps some thought they might have gone a little faster. He thought their experience would be very satisfactory, although he did not for a moment believe it would be anything like that of the South Metropolitan Company, as their district was very different, and they had not proportionately the same number of the special class of consumers who preferred these meters, and sought to have them fixed in their houses. The reason they had been slightly delayed (he hoped slightly) in going forward with this business, was that the offices of the County Council where the meters were tested and sealed before they could be issued, had their hands so full that they could not get the meters away from them. With respect to the question of rates and taxes—the bugbear to which he had had to call their attention every half year—they were still going up; and he saw no chance of their going down. During the last six years, the Company's payments upon the assessment of their entire undertaking had been as follows: In 1889, 5s. 1¼d. in the pound; in 1890, 5s. 2¼d.; in 1891, there was positively a fall of a ¼d., and they only paid 5s. 2d. that year. But they had to atone for it the following year, because in 1892 they paid 5s. 6d. in the pound; in 1893, 5s. 9d.; in 1894, 5s. 11¼d; and heaven only knew what it would be in 1895. The London County Council had themselves taken this matter up, and had introduced a Bill into Parliament for the purpose of dealing with the assessments and rating of the Metropolis in the future. They did not seem to have gone on very comfortably with Sir Peter Edlin; and they sought to take the matter in to their own hands. He had had a slight glance at the Bill; and a more mischievous measure he had never seen. They did not know whether it would be introduced as a Private or a Public Bill. If as a Private Bill, they would be able to appear against it by Counsel, with almost every other industry; but if it was introduced as a Public Bill, they must trust to Parliament to do justice to those industries which had been so greatly harassed by these enormous burdens. Their law charges had been very small—a circumstance upon which they might sympathize with the lawyers, but congratulate themselves. Bad debts were also in a very satisfactory position, and showed a decrease. With respect to the result of the half-year's trading, there was a gross profit of £539,243; or, after deducting debenture interest and other preferential charges, a net profit of £354,078, which allowed for the full statutory dividend, and left a surplus of £15,282. A letter from a shareholder had been put into his hand, just as he came into the room, asking why, since the price of gas was reduced 1d. per 1000 cubic feet from midsummer last, there had not been an extra ¼ per cent. in the dividend this half year. They had always held—rightly or wrongly, and they had been so advised—that they could not make an addition to their dividend except in the case of a reduction of price for a whole year. That was to say, the reduction must be in force for one year instead of part of a year only. He thought it was obviously undesirable that there should be fractional additions to, or subtractions from, their dividend. He was fully aware that this view was not held by other companies. But it had been their practice; and they saw no reason to depart from it. As he had said, they were upheld by their legal advisers in thinking that this was the intention of the Act of Parliament. The surplus of £15,282 must not be taken as representing the excess profit at the current price of gas, because the reduction of 2d. dated from Oct. 1 last; and 2d. for the September quarter alone represented £23,000. So had the price of gas been at 2s. 10d. for the whole half year, there would have been a small deficit of £8000, instead of a surplus of over £15,000 on Dec. 31 last. Their working at the present moment, therefore, did not appear to warrant any further abatement in their price. It was true there were some signs during the present Arctic weather of an increased demand for gas; also that the markets for coals were likely to be cheaper, while the prices for their manufactured products generally were rather more favourable. Instead of making any further reduction in the price of gas, however, the Directors, after full consideration, came to the decision that they would do what he referred to in his speech last August, but which he then made more or less conditional—that was to say, the Board had decided to abolish the meter-rents altogether. They were bound to inform the shareholders that, in doing this, they had on their behalf made to the public a slight concession; and it might be taken in some sort as an answer to those who were going about at public meetings and describing them as the most avaricious Shylock (as a company) that ever existed. Having taken the meter-rents off, it was not likely—at all events, it was not probable—that they would be put on again; and what the Company lost (but it was the only thing they lost) was a potential 3s. per cent. power in declaring a dividend. This was a small price to pay for getting rid of an objectionable and obnoxious charge; and a charge which, in the case of their Company, was anomalous, because in one portion of their district—the City of London—they were not allowed to charge meter-rents. Probably, they would agree with him that these little extras were things which were even more resented than a higher price for gas would be. It was like sending a boy to school and being charged £60 or £70 a year for his board, tuition, and lodging, and then charges being made of a guinea for stationery, a guinea for the school library, and a guinea for a seat in church. They found that many of their consumers looked upon the charge for meter-rents very much in the same light as these "extras" were viewed by parents. He was perfectly certain that their action in this matter would be regarded with high appreciation by the great majority of their customers. He desired to state that they had not done this in response to any threat or agitation outside. He had no doubt Mr. Rowlands would say: "I denounced the meter-rents, and like the walls of Jericho, they have fallen." A Mr. Hersey, too, had written about the meter-rents; stating that the charge was illegal, and that he would not pay it. They first tried the *suaviter in modo* with this gentleman; and he declined to pay. Then they tried the *fortiter in re*, and sent him a County Court summons; and he paid on the previous day. (Laughter.) He thought the consumers ought also to bear in mind, when they heard the Company spoken of as such avaricious traders, that they had not only given up, in abolishing meter charges, £58,000 a year, which was equal to four-fifths of a penny per 1000 cubic feet, and to that extent postponed any further reduction in the price of gas and increase in dividend, but the reductions in their charges for gas in the past six months amounted altogether to 3d. per 1000 cubic feet, or £210,000—making, with the other £58,000, a reduction of £268,000; the proprietors' share in consideration of this being only £42,000. He had been very much amused at the construction put upon an unfortunate phrase which, in the lightness of his heart, he made use of last August, when he spoke of gentlemen going to the Board of Trade as "the common enemy." Mr. Rowlands said that that meant the consumers. He (the speaker) had to thank Mr. Livesey for setting this matter right. It was not the consumer, but the agitator to whom he had referred as the common enemy.

The consumer could not be an enemy. The consumer and the shareholder were partners; and the consumer was the predominant partner, because out of every sovereign of profit the consumer took 16s. 8d., and the proprietor 3s. 4d. He could not conceive how Mr. Rowlands or Sir Albert Rollit could have fallen into such ineptitude as to state that he had for one moment described the consumer of gas as the common enemy. However, one could not account for what was said at deputations. Perhaps he might be allowed to make a few remarks with respect to this deputation, because he thought it marked a very important crisis in gas politics. He was away when it took place; but he read the account of the deputation with great interest. It reminded him of a public meeting held at Ephesus, of which it was written: "And the more part knew not wherefore they were come together." Mr. Bryce, when they went away, asked them to make up their minds what they wanted before they came to him again. He understood that in the past six months these gentlemen had been asking themselves whether they should have a public or a Board of Trade inquiry. The Company had not the slightest objection to any inquiry, so long as they were not asked to pay for it. If an inquiry was to be held, and they were expected to have to pay for it, they would strongly object and decline. Any question whatever which any official of the Board of Trade, or any person properly qualified or authorized had sent to their office, had met with an immediate and courteous reply. There was no need for any inquiry; but if Parliament chose to grant it, the Company had no objection. Everything they did was open to the inspection of the Board of Trade; and their accounts were published and laid before both Houses of Parliament. What an inquiry was wanted for, he did not know, except to find out why they should not be compelled to sell their gas at the same price as other Companies. This was an old story, which he had gone over many times, and with which he would not trouble them again. He could only say that it was impossible to compare things which did not admit of comparison. Everything was cheaper on the South side of the Thames, from taxes to turnips—rent, water, gas, everything was cheaper on the South side of the Thames than on the North. Let the district of The Gaslight and Coke Company be compared with that on the South side of the river. They had big squares and terraces of houses which were empty half the year; and, moreover, when these large houses and institutions were occupied, a good deal of electric light was used in them. There was nothing of that kind to contend with on the South side of the river; and therefore their Company's load factor was so much greater, and the amount of capital required to carry on business North of the Thames was much larger than that which was required on the other side. It was of no use to hold an inquiry to see if this could be altered, because it could not be, as it was inherent from the state of things. One or two other remarks were made at the deputation, to which he might refer; but it was more in what they had not stated than in what they did say, that the members of the deputation had done the Company wrong. Nothing, whatever, for example, was said about the auction clauses. Complaint was made of a 12 per cent. dividend; and it was said that Parliament would never grant a dividend of 10 per cent. again; but if Mr. Rowlands, or whoever dealt with this subject on that occasion, had called attention to the auction clauses, it would at once have been seen that it was exactly the same thing whether 5 per cent. was paid to two men holding £100 each, or 10 per cent. to one man holding £200. The Bill brought in to Parliament by the South Metropolitan Company would be a very useful object-lesson on this point to the gentlemen who formed the deputation in question. They would see that, after all, the high dividend complained of did not really exist, but was merely a matter of account; and, in fact, the amount of interest obtainable by anyone who invested in gas stocks at their present price was considerably below 5 per cent. There was another gentleman at the deputation—a Rev. Mr. Canney—who gave utterance to one of those platitudes which one would expect to hear from a political parson of a socialistic type. It must be remembered, said Mr. Canney, that what Parliament had given, Parliament could take away. Of course it could. It could repudiate the National Debt and abolish *habeas corpus;* but it would not do so. He thought it much more probable that Mr. Canney would be disestablished and disendowed than that the gas companies would be. It seemed to him that this reverend gentleman was a little out of place in the raiding expedition in question; but he supposed Mr. Canney played the part of Friar Tuck. With respect to the future, he thought they might congratulate themselves on their position. At length the public had begun to appreciate the value of gas stocks; and there had been a very substantial rise in their market price. He did not know what the cause of this might be; but perhaps it was owing to a "bear" article written in the *Investors' Review* by Mr. Wilson. That gun, however, seemed to have missed fire, because ever since the article was written, the price of gas stocks had continued to rise, instead of fall; and he was not certain that they had reached their highest point. There was an anomaly in this matter, too, as well as in the question of the price of gas. Why should the "B" stock of the South Metropolitan Company, which for years had paid the same dividend as the "A" stock of the Chartered Company, rank in the market some 30 per cent. higher than the "A" stock of their Company? And why should it occupy that position, especially when their Company's "A" stock, presumably, would pay—for it carried the statutory rate—a dividend of 12¾ per cent., against the 12 per cent. carried by the "B" stock of the South Metropolitan Company. The cause might probably be that the latter was a very small stock, and well held; and so could not be bought. Still, he thought either that the stock was a little too high, or that their own stock was a little too low; and probably they might approximate before very long. The Directors fully intended to pay the extra ¾ per cent. this half year. They hoped that their revenue would enable them to do so within a reasonable amount; but if there were a small deficiency, they would not hesitate to dip into their undivided profits and reserve fund, which existed for that very purpose. He, therefore, thought he might say with a tolerable amount of certainty that they would receive in the present half year an extra dividend of ¾ per cent. He might remark, with respect to the reserve fund and the undivided balance, that they now amounted together to £380,954—the reserve fund at the 31st of December last being £125,699; and their surplus profit, £255,255. This was the fund upon which they had to draw for the equalization of their dividends, if necessary. If things went well, and they bought coal at reasonable rates, there might be even a question of a further reduction in price, sooner or later. Before sitting down, he desired to express the very great satisfaction with which he had read the statesmanlike remarks of Mr. Bryce in dismissing the deputation already referred to. The right hon. gentleman asked them what they wanted, and told them what steps they should take to get it. But he alluded in no faltering language to the sanctity of a parliamentary bargain—going so far as to say that even if it was a bad bargain for the public, it should not be disturbed. He (the speaker) had shown that it was not a bad bargain for either the consumer or the shareholder; and he was certain that Parliament would not, for the sake of gentlemen who were out on a little vote-catching expedition, break, or allow to be broken, a solemn compact made under the parliamentary seal, and the terms of which had been rigidly and honestly observed by the Company ever since they had been in force. He thought that Mr. Bryce's statement, coming as it did from a man whose politics would naturally incline them to expect something different—he being a Radical—was highly satisfactory, and did him great credit. He felt sure that, in the opinion of the public, the right hon. gentleman's statement would add to the security of what was regarded as very secure before.

The DEPUTY-GOVERNOR (Mr. Howard C. Ward) seconded the motion.

Mr. COPPIN said that the report did not convey to him that they were in a very great state of prosperity. Going back to 1889, he saw that the progress of the Company had not been quite what they might have hoped; for he found that in the interval their capital had increased by £1,500,000, and their reserve fund was nearly £300,000 more in 1889 than it was now. They were also charging 7d. per 1000 cubic feet more for their gas, and were consequently receiving 1¾ per cent. less dividend. They had also actually sold 26 million cubic feet of gas less. He thought all these comparisons should induce them not to take off the charge for meters, but, on the contrary, to "nurse" their resources until they had brought their reserve fund to something above what it was four or five years ago. They were always being brought into comparison with the South Metropolitan Gas Company; and the abolition of meter-rents would make their price for gas appear still more out of proportion when compared with that charged by the South Metropolitan and other companies who were paid for meters. In the event of agitation, the price charged by them for gas would be sure to be compared with that of other companies; and nothing would be said about this Company not charging for meters.

Mr. GALBRAITH expressed a hope that they would eventually hear something about the consolidation of their stocks. He also thought that the Directors ought to watch the progress of the South Metropolitan Company's Bill; and if it went through, and the duplication of the stocks was sanctioned, they ought to follow suit. There were a great many people who did not understand the auction clauses; and these were the very persons who went about poisoning people's minds against the gas companies.

Mr. BUTT referred to the fines which had been imposed on the Company for not supplying gas of the required illuminating power. Their standard, however, might be absolutely correct as far as the Act of Parliament was concerned, although it did not follow that the standard used at the testing office was the same.

The GOVERNOR, in reply, said that Mr. Coppin had compared their position in 1894 with what it was in 1889; but their friend must have forgotten what a great many things had happened since 1889. They had had strikes, coal famines, an enormous increase in the price of labour, and three or four very mild winters, which had militated against the natural increase in the sale of gas. As a matter of fact, their position was not quite so bad as it had been painted; and he had never known Mr. Coppin to be in such a pessimistic frame of mind as he was on the present occasion. (Laughter.) With a dividend of 12 per cent., and ¾ per cent. additional coming next time, he really did not think that they ought to be downcast. He thought that he had fully justified the Directors' action with respect to the abolition of the meter charge; and if that step was to be taken, he saw no advantage in postponing it. Mr. Coppin had said that it would give a handle to agitators; but the Directors did not care "a snap of the finger" for agitators. The latter had their game to play; and the Directors had the interests of the proprietors and the public to look after. They were not the only people who were abolishing meter-rents; the great City of Manchester was taking the same course. This led him to make a remark which he omitted before. He had expressed great appreciation of Mr. Bryce's remarks, from only one of which he disagreed—where the right hon. gentleman spoke of the municipalization of gas undertakings. He (the speaker) knew that there were two sides to this question; but he was quite sure that, if it was a good thing for the ratepayer who did not use gas, it was not a good thing for the ratepayer who was a consumer of gas. He was not, however, going into this matter now; for it had been most ably dealt with by Mr. Livesey in a paper contributed by that gentleman to a periodical, in which he had travelled over the whole question, and he (the speaker) thought conclusively proved that the municipalization of gas undertakings was not a desirable thing for consumers of gas. With respect to Mr. Galbraith's remarks, he was personally very much of that gentleman's opinion as regarded the consolidation of stocks. When they went to Parliament again, they would try and deal with this question, although he could give no pledge about it. The South Metropolitan Company were going to Parliament for a Bill, and they (The Gaslight and Coke Company) would have the benefit of their neighbour's experience. If Parliament granted the South Metropolitan Company what they were applying for, he did not suppose that a similar application from this Company would be refused. But if the South Metropolitan Company were not successful, there was no reason why their own Company should go to Parliament and sustain a rebuff. With regard to Mr. Butt's remarks about testing the gas, a very strong Committee had been sitting on the subject, and they hoped before long to get rid of the very uncertain and unreliable system of testing which existed at the present time. He believed that the method of testing which it was proposed to adopt was the pentane gas-flame, which was pretty certain in its action; and it would be a decided advantage to the Company. He believed that this system

was certain to be adopted; and he believed that it had the support of all the London Gas Companies.

The motion was then unanimously agreed to; and resolutions were passed declaring the dividends recommended, and re-electing the retiring Directors and Auditors.

The GOVERNOR, in acknowledging a vote of thanks, said he might just mention, with regard to the question of meters, that the City of London Electric Lighting Company were reducing their meter-rents, with the view, he supposed, of eventually abolishing them. He had not referred to the electric light, as there was not much to say about it; and until the late explosions were satisfactorily explained, they need not trouble themselves about them. He hoped the proprietors would allow the staff of the Company, who served them most admirably, to be included in the vote.

The proceedings then terminated.

BRENTFORD GAS COMPANY.

The Half-Yearly Report and Accounts.

In the report which the Directors of the above Company will present at the half-yearly meeting next Friday, they express their pleasure in notifying a further reduction of 2d. per 1000 cubic feet in the price of gas, to come into force as from the taking of the meter indices for the past Christmas quarter. This reduction, and that which took place at Midsummer last, brings the present price of the Company's gas down to 2s. 11d. per 1000 cubic feet. The sale of gas during the six months ending Dec. 31 last, notwithstanding the mildness of the season, was satisfactory; showing an increase of 6¼ per cent. over the corresponding period of 1893. The demand for gas by the automatic meter system continues rapidly to increase; and the Directors are anticipating favourable results from this branch of the Company's business. Reference is made to the prevalent great depression in the markets for residual products; and hope is expressed that, with a revival of trade, better prices will again be obtained. The system of inclined retorts is giving satisfactory results; and at the Southall works a new retort-house on this system, and for 18 beds, is in course of construction. At Brentford, the horizontal retorts in No. 4 house are being replaced by the inclined system; and the Directors hope to have both houses ready for work at an early date. The sale of £30,000 of new stock, 1881, in September last, realized £51,546; the whole amount having been tendered for above the minimum price named in the conditions. The sum available for division is £69,995; and the Directors recommend dividends at the rates of 5, 11½, and 8½ per cent. per annum.

With regard to the accounts accompanying the report, the revenue from the sale of gas amounted to £94,589, as compared with £93,947 in the second half of 1893; the rental of meters and stoves, to £4477, against £3910; residual products, to £27,987, against £22,738; and the total receipts to £127,148, as compared with £120,678. On the expenditure side of the revenue account, coals cost £40,054, against £38,443; the total manufacturing charges being £63,984, as compared with £61,617. The total expenses in the half year came to £83,288, against £79,589; the balance carried to the profit and loss account being £43,860, as compared with £41,089 at the end of 1893. With regard to manufacturing operations, 63,080 tons of coal and cannel were carbonized, and 639,191,000 cubic feet of gas made, of which 620,879,000 cubic feet were accounted for. In the corresponding half year, the quantity of raw material dealt with was 59,438 tons; and the production of gas was 611,178,000 cubic feet, of which 586,464,000 feet were accounted for. The residual products are estimated as follows: Coke, 42,019 tons; breeze, 5028 tons; tar, 621,846 gallons; ammoniacal liquor, 19,128 butts of 108 gallons (including 474 butts purchased).

ILFRACOMBE GAS COMPANY.

The Company's Bill Sanctioned by the Shareholders.

A Special Meeting of the Ilfracombe Gas Company was held yesterday week, for the purpose of formally approving the Company's Bill for the removal of the works to Hele, and for other purposes. Mr. T. D. WIVELL, the Chairman of the Company, presided.

The CHAIRMAN complained of the unfair criticism of the Bill at the recent meeting of ratepayers, and said he could not see where all the supposed injury to public rights came in, or how a whole district was going to be ruined by the removal of the gas-works. When the works were transferred to Hele, the present site would be cleared entirely, for it would be too valuable for the Company to retain, and it would be an error to keep two gas-works and two staffs of men employed for so small a town as Ilfracombe. He contended that the proposed road at Hele would be a public improvement; and that the beach, instead of being destroyed, would be improved. Ilfracombe, unlike other towns, did not offer a variety of sites for gas-works. As the consumption of gas increased, they must either enlarge the works on the present site or go to Hele. The shareholders were as interested in the welfare of Ilfracombe as anyone; and it was not likely that they would wish to injure the town in any way. If the ratepayers wished the Company to stay in the centre of the town, and take in adjoining properties, and would assist them in promoting a Bill for the purpose, the Directors would bring the matter before the shareholders; but the opposition from property owners around would be terrible. For himself, he saw no alternative than to go on with the present scheme. If there was anything in the Bill to which the District Council objected, the Directors were perfectly willing to meet them, and try to settle the matter amicably.

Some discussion followed as to the possibility of bringing coal vessels up to the site of the proposed works at Hele.

Mr. R. LAKE (a Director) said they were advised that vessels could easily discharge there.

The CHAIRMAN added that the opinion of nautical men had been taken on the subject.

The Bill was then approved by 846 votes to 21—one shareholder only opposing.

PROVINCIAL GAS AND WATER COMPANIES.

During the next few weeks, we shall collect, under the above heading, the most noteworthy particulars from the reports and accounts of Gas and Water Companies carrying on their operations in different parts of the country.

Gas Companies.

The half-yearly meeting of the Cambridge Gas Company has been held; and, in the course of his remarks on that occasion, the Chairman (Mr. Dennis Adams) said he thought the shareholders might congratulate themselves on coming out of the depression consequent upon the coal strike, and getting on to their legs again. For this good result, they were very much indebted to the able management of Mr. Weeks. Dividends of 10 and 7 per cent. were declared; and, during the proceedings, it was mentioned that, instead of having to draw from the reserve fund, as in the previous year, to enable the Directors to pay the dividends, they had on this occasion £300 or £400 to transfer to it.

The accounts to be presented at the half-yearly general meeting of the Dorchester Gas and Coke Company, Limited, to-day show that the total revenue in the six months ending Dec. 31 last was £3408; and the expenditure, £2278—leaving a balance of £1130. The sum in hand available for distribution is £1153; and the Directors recommend dividends at the rates of 10 and 6 per cent., less income-tax, on the Company's capital. This will enable them to replace a portion of the amount previously withdrawn from the reserve fund. Manufacturing operations were facilitated during the period covered by the report by the enlargement of the coal-stores to the extent of 800 tons; the total storage capacity being now about 1800 tons. This is no doubt a welcome improvement to the Manager and Secretary (Mr. F. Osmond), who will be able to reduce his freights in the winter months, and consequently the average cost of coal per ton.

On the past year's working, the Durham Gas Company have an available balance of £3041 (after deducting the interim dividend of £2480), out of which the Directors recommend a dividend of 5 per cent. on the original capital and 3½ per cent. on the additional capital; making a total dividend for the year of 10 and 7 per cent. respectively, and leaving £561 to be carried forward.

By the half-yearly report of the Grantham Gas Company, the shareholders are informed that the condition of the works is favourable, and that the consumption of gas continues to increase steadily. Since the last meeting, large and convenient premises in the High Street have been acquired, part of which has been adapted as showrooms and offices. A dividend of 5 per cent. is to be paid on the old shares and 3½ per cent. on the new shares for the half year.

The Malton Gas Company have had an increase in the sale of gas of 5½ per cent. during the past half year, compared with the corresponding period of 1893; but the residual products have not realized so much as previously owing to the low prices prevailing. Including £798 brought forward, there is £2015 available for interest and dividends. The Directors recommend the usual dividend at the rate of 10 per cent. per annum, free of income-tax, after paying which there will be £891 to carry forward.

The annual meeting of the Sandown (I.W.) Gas Company was held on Monday, the 4th inst.—Mr. R. Woodward presiding. The Chairman, in moving the adoption of the report and accounts, congratulated the shareholders upon a prosperous year, and mentioned that the receipts for gas showed a slight increase, although the make had been more than half a million cubic feet less. The unaccounted-for gas was upwards of 5 per cent. less—a fact which he thought spoke well for the present management. The receipts from coke were also higher—32 tons more having been sold, although 73 tons less were made; that used showing a saving over the preceding year of 105 tons, or about 25 per cent. Though the coal contract was not such a favourable one, coals had come to £140 less than in the preceding year; and purification was just half of the previous year's cost. These economies in working results had admitted of very necessary repairs to the works being made without affecting the year's profits. The average make of gas for the twelve months was 10,306 cubic feet per ton of coal, as compared with 9350 cubic feet in 1893 and 8780 cubic feet in 1892. He thought the shareholders would agree with him that the year's working was very creditable to their Manager (Mr. H. W. Falkner). A dividend at the usual rate of 8 per cent. was declared; and a vote of thanks was unanimously passed to Mr. Falkner.

The half-yearly general meeting of the Scarborough Gas Company was held last Saturday. The accounts presented showed that the net revenue, including £597 brought forward, was £7640; and out of this, after providing for dividend on the preference stock, the Directors recommended the payment of the usual dividends on the other stocks, less income-tax. This absorbed £5246, and left £2394 to be carried forward. A scheme for the renewal of a portion of the carbonizing plant of the Company, on the system of gaseous firing, has been approved by the Board; and the work will be proceeded with at an early date. This renewal will absorb the greater portion of surplus balance accruing on the past half-year's working.

At the half-yearly general meeting of the Weymouth Consumers' Gas Company next Thursday, the Directors will report a profit of £2656 on the working of the undertaking in the six months ending Dec. 31 last. The receipts amounted to £7068; the expenditure to £4412. The sum available for distribution is £3291; and dividends at the rates of 10 and 7 per cent. per annum, less income-tax, will be recommended. The sum of £370 has been transferred from the undivided profits to the reserve fund; making this fund up to £3000. The Directors consider an opportune time has now arrived when a reduction can be made in the price of gas. They have therefore decided to lower the figure 2d. per 1000 cubic feet (from 3s. 10d. to 3s. 8d.) as from the 1st ult.

The Chairman of the Willenhall Gas Company (Mr. Clement Tildesley), in moving the adoption of the Directors' report at the half-yearly meeting of the shareholders last Wednesday, referred with satisfaction to the decision of the Directors to reduce the price of gas by 3d. per 1000 cubic feet as from the 1st of April next, and stated that the price would then be as low as was charged in Wolverhampton and some other large towns. He also mentioned that the local rates

were now equal to 3d. per 1000 cubic feet of the gas sold. Dividends ranging from 5 to 2½ per cent. on the various classes of shares were declared.

The half-yearly report of the Directors of the York United Gas Company states that the balance of revenue account, carried to profit and loss, amounts to £6287. Of this sum £338 has been paid for the half-year's interest upon money borrowed on mortgage, leaving £5949 available for dividend. This latter amount falls short of the sum required by £1050; but as this deficiency can be taken from the surplus profits of previous years, the Directors recommend that the usual rate of dividend be declared of 5s. per share upon both the old and new shares, free of income-tax. This arrangement of husbanding the surplus profits of good years is, the Directors remark, mutually advantageous to both the gas consumers and the shareholders, who are practically partners in sharing the Company's prosperity—the shareholders in getting their dividend, and the public in getting gas at prices (1s. 10d. to 2s. 1d. per 1000 cubic feet) which few towns in the kingdom can equal. The sales of gas only show an increase of 1 per cent. upon the half year.

Water Companies.

The receipts of the Camborne Water Company for the six months ending Dec. 31 last amounted to £1159—an increase of £159. The profit for the half year is £777; and the divisible balance is £924. A dividend of £9 and £6 6s. per cent. respectively on the "A" and "B" shares is recommended.

On the working of the past six months, the Cambridge Water Company have realized sufficient profit to pay dividends at the rate of 10 per cent. on the consolidated stock and 7 per cent. on the amount called up on the new shares, and to carry forward, with the balance from the preceding half year, £4145. The business shows a gradual progress. The number of premises connected during the six months was 132, from which is derivable an increased rental of £160 per annum. The total number of premises now supplied is 13,703.

The Consett Water Company have had a satisfactory increase of revenue during the past half year; the receipts from domestic rentals being £388, and the mechanical rentals £997, in excess of the corresponding period of the previous year. After the payment of interest and other expenses, there remains an undivided profit of £6939, out of which the Directors recommend the payment of a dividend at the rate of 6½ per cent. per annum, which will absorb £5686. The Directors are taking steps to acquire the land necessary for building an impounding reservoir on the Hisehope Burn, and also for the filter-beds which the Company are under an obligation to construct. Two iron tanks have been erected on the site of the Loud reservoir, and brought into use. At the forthcoming meeting, the shareholders will be asked to consider the question of issuing all or part of the share capital or stock authorized to be created by the Company's Act of 1894.

The Grantham Water Company's revenue account for the past half year shows a balance of £5178, of which £1750 is to be devoted to the payment of a dividend of 5 per cent. for the six months.

In addressing the shareholders of the Weardale and Shildon Water Company, whose accounts were noticed a fortnight since, the Chairman (Mr. B. Dale) stated that during the past year there had been expended on capital account £1827, as against £6822 in 1893. As to the revenue, the gross receipts were £37,061; and in 1893 they were £37,604. The falling off was explained by the fact that the great drought of 1893 was of special advantage to that particular year. The working expenses were £7128, as against £7520 in 1893—a decrease of £392. He thought this was largely attributable to the fact that in the account for 1893 there was a special item of £500 for a duplicate pipe-line from Waskerley to Tow Law. The general result was that the net revenue amounted to £32,740, including £4686 brought forward from the preceding year. The Directors recommended that (having paid an interim dividend which absorbed £12,375) there should now be paid a final dividend of 12s. 6d. per share; making the full payment for the year of 4¾ per cent. per annum. This would enable them to carry forward a balance of £5571. The report was adopted.

The Directors of the York New Water Company in their half-yearly report state that, in consultation with Messrs. Hawksley, they have come to the conclusion that the time has arrived when, to maintain the efficiency of the water-works, they must obtain further capital and powers. A Bill has accordingly been deposited for the ensuing session of Parliament. Subsequently to this step being taken, a letter was received from the Town Clerk, to the effect that the Water Committee had decided to report to the Council that they were of opinion that the water supply of the city should be under the control of the Corporation; that they recommended that a petition should be lodged against the Bill; and that the Committee instructed him to inquire whether the Company were prepared to sell their undertaking. The Directors informed the Town Clerk that they had no wish to sell the undertaking; and no doubt in saying this they were correctly representing the views of the shareholders. The Directors consider that the Company have, for nearly fifty years, conferred great benefits upon the citizens by providing them with an excellent and abundant water supply, and furnishing within the old city area a gratuitous supply of water for cleansing the sewers and watering the streets; and they are aware of no ground of complaint against the management of the undertaking, and of no reason why it should be transferred to the Corporation. At the meeting of the shareholders last Thursday, the following dividends for the half year were declared: 5s. per share on the preference shares, 10s. per share on the ordinary shares, and 7s. per share on the new shares, 1878 and 1879, for the past half year.

The Sandwich Town Council and the Gas Company.—At the quarterly meeting of the Sandwich Town Council last Saturday, a letter was read from the Gas Company stating that they declined to entertain the suggestion made to them for the disposal of their works to the Corporation at a price fixed by valuers; but if the Company would make an offer of a definite sum, the matter would be laid before the shareholders. Alderman Hughes said the Gas Supply Committee would shortly be in a position to recommend the adoption of a scheme for lighting the town entirely independently of the Gas Company.

THE EXPLOSION AT THE DALMARNOCK GAS-WORKS.

Board of Trade Inquiry under the Notice of Accidents Act, 1894.

Last Friday, Mr. A. G. Vernon Harcourt, of Oxford, one of the Metropolitan Gas Referees, conducted an inquiry in Glasgow, on behalf of the Board of Trade, into the circumstances attending an explosion, or outburst of flame, which occurred on the morning of the 13th of December last at the Dalmarnock Gas-Works of the Corporation, by which seven men were burned. The inquiry was the first to be held in Scotland under the Notice of Accidents Act of last session.

Mr. Bowers, Assistant Town Clerk, represented the Corporation.

Mr. Harcourt opened the proceedings by reading the clauses of the Act relating to the inquiry, and the order of the Board of Trade.

William Paterson, Under-Manager at the Dalmarnock works, was the first witness. He stated that he had held his present position for 15 years. On the morning of the 13th of December, he was at the works. There were three sets of purifiers, with four purifiers in each set. The accident occurred in No. 1 purifier, while the box was being emptied. The emptying of the boxes was of daily occurrence. Sometimes in the winter two or three boxes were emptied; but in the summer the work was less. Only once or twice in the winter was it so dark that artificial light was used; and on this occasion, between six and seven in the morning, it was nearly dark. It was quite impossible that gas could still be entering the box at the time of the accident, owing to the construction of the valve, which was covered by 26 inches of water. The valves would not shut unless they were in their proper place. Whatever gas took fire could only have been occasioned by what remained in the box. The particular valve that controlled the access of gas to the box was in perfect working order. The first operation was to lift the lid of the purifier, and shift it on the top of the others, so that the men could get inside to work. The lime in the purifier was then exposed to the air, and gas escaped therefrom, having been shut in between the two layers and the bottom of the box. He could not say how soon after the emptying of the lime the gas would practically have all escaped, so that there would be nothing to take fire.

Mr. Harcourt: Would you say that for some time during the operation of removing the lime there would be a danger of fire if there were anything to light the gas?

Witness: At first, when the men break in, there is bound to be a little gas underneath; but after that it had free access to get away.

Do you believe the men are aware of the danger that the presence of a light would entail?—Most thoroughly aware. Most of them are old hands—some being as long as 15 or 16 years at the same job.

Is it possible that any of the men might have matches upon them for the purpose of smoking—not then, but at another time?—I should say none of them have matches about them. They generally work with nothing on but their trousers and shirt.

Have you formed any opinion as to how the gas came to take fire?—The only opinion I have formed is that one of the shovels struck a small stone, which might cause a spark and ignite the gas.

Have you ever known gas to be fired by such a cause as you now assign?—Never in my experience.

But you can think of no other mode?—There is no other mode that I can think of; and I have thought a good deal of it.

By Mr. Bowers: The emptying of the purifying-box was a usual and necessary operation in connection with the gas-works. The boxes at the Dalmarnock works were of the usual kind, and were of the most modern and approved description. Perhaps it was a quarter of an hour or ten minutes after the men had started to interfere with the lime that the explosion took place. The purifier was in perfect order at the time of the accident.

John Walker said he had been 24 years employed at Dalmarnock, and lately he had been engaged as foreman. The area of the purifying-box was 35 square feet. It was not his experience that as soon as the lime was lifted there was an escape of gas from the space between the two layers of lime. He could not say what caused the flame, as he was not at the place at the time.

By Mr. Bowers: None of the men had any lights, and there was no light in the place of any description.

Mr. *G. R. Hislop*, Gas Engineer to the Paisley Corporation, said nothing that he had seen at Dalmarnock was at all unusual. The arrangements were quite the ordinary ones; and the mode of lighting the purifying-house was quite safe.

Mr. Harcourt: Am I right in supposing that, for some time after the emptying of the lime from the top layer is begun, enough gas will remain beneath it to be either explosive or inflammable?

Witness: I should say certainly; it would be there for a considerable time until it gets thoroughly cleared off. That is indefinite; it depends upon the nature of the atmosphere.

In further examination, witness said the men would be well aware that they had a combustible or explosive material under their feet. They were all warned; and, besides that, notices were posted up prohibiting smoking and the carrying of means of lighting. The rules were very strictly adhered to; for the men knew their own lives were at stake by a violation of them. He could conceive of no reason for the lighting of the gas except the causing of a spark by some one striking a shovel on a piece of unbroken lime, flint, or the side of the purifier He had never known gas to be lighted in that manner; but he had no hesitation in saying it could be done. He had no precaution to suggest by which such an accident might be made more unlikely in the future. It might not happen again for fifty years. Such accidents were exceedingly unusual so far as regarded purifying by lime; but with oxide of iron the danger was greater. He was satisfied that the valves were such that it would be impossible, after the lid had been taken off the purifier, that there should still be any passing of gas into the boxes.

By Mr. Bowers: The only possible explanation of the accident was the one he had already indicated; and if that were so, it could not have been obviated.

Mr. *W. Foulis*, Gas Engineer to the Glasgow Corporation, said he was on the spot about three hours after the accident, and there was

nothing to account for it. There was no possibility of fire being near. He had never had experience of such an accident before. It would be well to caution the men against striking the side of the box too violently; but, of course, it was almost impossible to avoid all risk of something of that kind occurring.

Mr. HARCOURT: Can nothing more be done than is customary to quicken the escape of the gas from between the layers of the lime?

Witness: No. The layers of lime might be opened up, and the gas allowed to escape; but in certain weather this would not be sufficient to take away the gas. It lies sluggishly in the lime, and underneath the grids; and you never can time its escape. Since the accident, it has been the custom to remove some of the grids in cleaning.

By Mr. BOWERS: It was not necessary, in the operation of removing the lime, that violence with the shovel should be used; and if this had been done, it must have been accidental.

Charles M'Allister, one of the labourers employed at the gas-works, said that, when the lid was removed from the purifier, there was no unusual escape of gas. He had known his shovel strike against a stone in the lime; for it was not easy to prevent stones from getting mixed with it. The stones came out of the kiln, and were generally of flint. At the time of the accident, there were two gushes of flame with a very short space between. He had never seen a light used in the purifiers, except a covered lamp. He had never seen a spark struck by his shovel.

By Mr. BOWERS: The danger was well known to the men; and instructions and precautions regarding lights were given by the foreman.

Henry Fullerton, labourer, asked whether he had ever seen a spark made by the shovel striking the iron box, said: "No; not often."

Robert Ward, labourer, said he had seen sparks when the shovel struck the iron part of the purifier. He had never known the lime to become so hot as to light the gas.

Mr. *Alex. Wilson*, Manager of the Dawsholm works, said he had had experience in London of an accident somewhat similar to the present one, caused by the lighting of the gas between the two layers of lime. The men had been working with safety-lamps, and they found after the accident that one of the lamps was faulty. There were three or four men burned, but not seriously. He had been 19 years about gas-works, and this was the only occasion he knew of an accident really occurring.

By Mr. BOWERS: It was quite possible that the accident might have been caused by a spark being generated; but he had never heard of it.

Mr. *James Manwell*, Manager of the Dalmarnock works for 23 years, gave a similar theory for the occurrence of the accident. He did not think it would be worth while to attempt to get rid of the stones in the lime; the diminution of risk being so small, and the labour it would entail so considerable.

This concluded the evidence.

Mr. HARCOURT remarked that he thought he had received all the information that was to be obtained towards forming an opinion on the matter. He expressed his thanks for the manner in which the evidence had been given. His only remaining duty would be to report to the Board of Trade as to the nature, circumstances, and cause of the accident.

Mr. BOWERS said he had to thank Mr. Harcourt for the care, pains, and trouble he had taken in this, the first investigation which had taken place under the Notice of Accidents Act, 1894. He thought he would agree that the Corporation of Glasgow had given the Board of Trade every assistance in conducting the present investigation. If any suggestion were made by the Board, the Corporation would give it their most serious consideration, and take whatever steps might be necessary to avert, as far as possible, a recurrence of such an accident, provided the diminished risks that would result from such suggestions would be worth the expense and labour which might have to be expended upon them.

The inquiry then closed.

THE RECENT EXPLOSIONS IN ELECTRIC LIGHT STREET-BOXES.

Major Cardew's Reports on the Cannon Street and Euston Road Explosions.

It will be in the recollection of our readers that an explosion in an electric light street-box, accompanied by shocks to various pedestrians, and the death of a horse, occurred in the neighbourhood of Cannon Street on Nov. 10 last year. The matter was investigated, on behalf of the Board of Trade, by Major Cardew; the inquiry extending over three days (Nov. 19, 20, and 23).* His report was made on Dec. 4 last; and it has recently been printed. It is accompanied by four appendices, the last of which is a diagram showing the positions of the principal points referred to in the report.

Major Cardew first of all describes the system of electrical supply in use by the City of London Electric Lighting Company, Limited. This consists of a high-pressure alternating current supply by means of concentric mains to converting-stations, constructed, as a rule, underground; and from these a low-pressure supply is furnished to consumers by distributing mains. The supply had been given from two generating-stations—one near the Custom House, and the other at Bankside. These stations were, however, only intended to provide temporarily for the lighting until the completion of the permanent station at Bankside. The operations connected with the transfer of the load to the permanent station were being carried out at the time the accidents occurred. Major Cardew next gives a general account of the affair, and attributes it to "the breaking down of the insulation of a high-pressure main in the street-box at the corner of Budge Row leading to the formation of a powerful electric arc between the outer conductor of this main and the end of the iron pipe forming a conduit for the mains under Budge Row, which projected into this street-box, and the consequent charging of this pipe to a dangerous extent; and the presence of gas in the Electric Lighting Company's pipes and street-boxes to an amount which formed a highly explosive mixture in the street-box at Walbrook, where the more serious explosion occurred—the gas being fired by the electric arc." He goes on to say that, "considering the nature of the explosions, the fact that one of them occurred at a distance of 26 yards from the electric fault, that the locality was admitted to be one where defects in gas-pipes had been rather frequent in consequence of the disturbance of the subsoil by the excavation for the completion of the Inner Circle Railway, and that no system of ventilation had been provided by the Electric Lighting Company for their conduits, there can, I think, be no doubt that the explosions were due to the firing of an accumulation of gas in the conduits by the electric arc formed at the point where the main broke down. The breakdown of the main was the consequence of a careless mistake, whereby an abnormal electrical pressure was brought upon the outer conductor, and this pressure found a point of weak resistance, probably a partial abrasion of the insulation, where the main was bent to enter the pipe leading from the box." Major Cardew describes the mistake as follows: "Two new mains had recently been laid—one from the generating station at Bankside to the Watling Street converting station; the other from Bankside to the Milk Street converting station. It was intended to connect the Watling Street main into the new switching apparatus provided for it at Bankside; but the end of the Milk Street main was put in by mistake, while the end of the Watling Street main was left lying on the outer lead coating of another new cable. . . . While the Watling Street main was lying in this position, instructions were sent to the foreman of the transformer department to switch the pressure on to it from the Watling Street converting station. As soon as he did this, an electric arc started at Bankside between the end of the inner conductor of this main, lying as above described, and the lead coating adjacent to it; thus effecting a connection of the inner conductor of this main, and of the whole system of mains, to earth." The sudden increase of current was at once noticed at Bankside; and some of the generating-machines were switched out of circuit. Subsequently, the Engineers at Bankside determined to switch off mains in succession until the fault was discovered; and by this means the fault was removed from the circuit. Major Cardew then offers the following explanation and comment:—

Having thus given an outline of the occurrences, I will now deal more particularly with the points in which I consider the Company and their officers and employees were to blame for want of judgment, carelessness, and inattention to the regulations imposed by the Board of Trade, and with the manner and means by which any repetition of such an alarming and serious accident may be avoided.

1. In the first place, it will naturally be asked: How was such an egregious mistake committed as the charging of one main under the impression that it was another? Bearing in mind that the pressure was one dangerous to life, it is evident that the consequences of such a mistake might easily have been fatal, since the end of the main that was charged might have been in a man's hand at the time.

2. Why, when the breakdown had occurred, since it certainly occasioned an excessive current in the mains affected, were these mains not automatically cut out of circuit?

3. Why, in the absence of proper automatic disconnectors, were there not at any rate some indicators to show the disturbance of potentials with regard to the earth and the rush of current through the mains affected; and how far might such indicators have prevented the breakdown, or shortened the duration of the dangerous condition?

4. How was it that the surface of the street at Budge Row could become so dangerously charged in consequence of any defect in the electric mains; and how can this danger be removed?

5. Why was not the high-pressure main in the street-box enclosed in a strong metal casing efficiently connected to earth, as required by Regulation 7, since this box also contained low-pressure conductors?

6. Why was the accumulation of gas allowed to which the Company attributed the explosion, and which they have themselves proved to exist in a neighbouring street-box since the explosion?

1. The facts elicited at the inquiry with regard to this point disclose in my opinion great negligence on the part of some of those concerned. It appears that the two new mains to the Milk Street and Watling Street converting stations respectively run side by side down Queen Street. The pipes to contain these mains had been laid some time previously. But the mains themselves were drawn in between the 9th of October and the 7th of November; some delay having occurred during the progress of the work, owing to the cables not being ready, and to alterations in one of the street-boxes. The mains are drawn into the pipes in lengths extending from one junction-box to the next, the ends of each length are labelled to correspond, and the jointers subsequently effect the necessary joints at the junction-boxes. Owing probably to some obstruction met with, the pipes between two junction-boxes in Queen Street were, to some extent, twisted round each other, so that their ends occupied different relative positions at the two boxes. The two mains were drawn in at the same time according to Mr. A. Cook, the superintendent of cable-laying; and, probably in consequence of the twisting of the pipes, either the labels were wrongly applied on the ends of the cables at one side of one or the other of these junction-boxes, or the jointers jointed ends marked "Watling Street" and "Milk Street" together. There is a direct conflict of evidence on this point between the foremen in charge of the laying and jointing respectively; but I do not think it is necessary that the Board of Trade should inquire too minutely into the question of the exact proportion of blame to be borne by the various subordinate officials of the Company. The main fact is admitted that between this point and Bankside Station, and in the station itself, the main to Watling Street was labelled "Milk Street," and *vice versâ*.

It is not, however, so surprising that such a mistake should have occurred, considering that the mains were laid and jointed up at the same time, and that the engineer in charge had not apparently given very close personal supervision to the work, as that one of these mains should have been charged to high pressure and connected into an electrical circuit, the electro-motive force in which was maintained by large engines and dynamos amounting to over 1500-horse power with-

* See JOURNAL, Vol. LXIV., p. 1026.

out previously identifying the main—that is to say, ascertaining by the very simplest electrical test (a test thoroughly understood by every telegraph linesman's assistant) that one of the cables brought into Bankside was in connection with the cable in Watling Street Station, and which of the two it was.

This blunder appears to have been partly due to a misunderstanding between the superintendent of cable-laying and the electrician in charge of testing, but principally, I think, to the latter having made a report that the Watling Street cable was good without having ascertained that the rough test of insulation, which was the only test he had taken, had been really applied to the whole cable. Had he taken the precaution to test this by directing the distant ends of the main to be connected together, so as to pass a current through the circuit thus formed, the wrong labelling of the two mains would have been at once discovered. It also appears to me that, in a matter of so much importance, the superintendent of cable-laying was too easily satisfied that the main was correct, when he knew that only a rough test had been made, and that he might with advantage have been present when the main was switched on.

2. The answer to this is that the fuses inserted with the object of providing an automatic means of cutting any main out of circuit in the event of a breakdown required much too large a fusing current to be an effective protection, more especially since, under the system of cross-connection of converting-stations at present in use, the fault will draw current from each end of the main, so that only a proportion of the current which is doing the mischief passes through either fuse. In this instance, the main which broke down in Budge Row was protected at each end by fuses calculated to act with 700 ampères passing; and it was practically impossible for the generating power running at the time to actuate them.

The reason alleged for the use of such large fuses is that, up to the present time, the whole supply has been given through a few mains, and any failure in one of these mains would throw an excessive load on the others. Fuses calculated on the normal maximum load for each main would, therefore, be insufficient to carry the increased working current in such a case, and a total stoppage of supply might result. Since, however, the maximum current intended to be carried by any one main is only 150 ampères, I consider that the fuses used were far too large, even from the point of view that continuity of supply was the first consideration.

The proper proportioning of fuses does not appear to me to have received due attention. The guiding principle seems to have been to take care that they were so large as not to cause inconvenience by acting. It is at times of light load that large fuses fail to act; and I am of opinion that it would be a desirable precaution, on all large mains used for high-pressure supply, to use a small fuse for light loads, and switch in a larger one before the time of heavy load. Of course, a reasonable margin must be allowed for possible unforeseen demands for current, and inattention might cause some trouble, unless the switching-in of the large fuse could be provided by automatic means. But the small fuse might be arranged to give warning when the current began to exceed its capacity.

While on the subject of fuses, I would direct attention to the omission on the charging of the new Watling Street main of a very simple precaution, which, had it been taken, would certainly have prevented the accident—viz., to charge the new main in the first instance through a fine fuse wire. Had this been done, the moment the arc started at the other end of this cable the pressure would have been cut off.

3. The observation of the potentials, with regard to the earth, of the two sides of an electric supply circuit is rarely provided for by electric light engineers, although it is a very important precaution, more especially in the case of high-pressure systems. Where the mains consist of separately insulated conductors, the occurrence of any fault of insulation is at once detected by the effect produced on their potentials; and the insulation resistance of the whole circuit can be obtained at any time without any stoppage of supply being necessary for purposes of testing.

In the present case, where the mains are concentric throughout, and where the potential of the outer conductor should always remain nearly the same as the earth, any rise of potential on this conductor must indicate a fault and a dangerous condition of the circuits. Such a rise of potential must have occurred before the breakdown in Budge Row took place; and it is probable that if a simple indicator of such rise had been fixed at the Watling Street station, and if the foreman there had been warned that it was an indication of danger, to be observed when any unusual operation was in progress, the accident would have been avoided.

Then again, as regards the current indicators. It appears, from the evidence, that the engineers at Bankside were quite in the dark as to where the unusual current was passing; and they had to resort to the expedient of switching off mains in succession until they discovered which were affected. Valuable time would have been saved had there been a current indicator for each main to refer to. I do not, however, wish to press this point too hard, as the new switch-room at Bankside was at the time in an incomplete state. The evidence of the station engineer is that the faulty cable was cut out in 13 minutes, while the recording voltmeter curves show a duration of 15 minutes. I think, with suitable indicators and prompt action, it might have been cut out within one minute; and had this been done, the explosions would not have occurred, and possibly even the death of the horse might have been avoided.

4. The charging of the surface of the ground resulting in the death of a horse and shocks to human beings was brought about in identically the same way as in the case of the accident at Bournemouth on Jan. 8, 1894, referred to in my report dated Jan. 20, 1894. Here again there was a short length of iron pipe (about 37 feet in this case, 32 feet in the Bournemouth case) terminating at the brick walls of the junction-boxes at each end, and not in metallic connection with the iron pipes on the other sides of these boxes. The depth of the pipe below the street-level varied from 1 ft. 4½ in. to 2 ft. 6 in. (about 18 inches in the Bournemouth case). In this case, it is true that the surface of the street was wood pavement, which might be supposed to offer considerable resistance to the passage of an electric current. But the weather had been unusually wet for some time before the occurrence; and the wood blocks and underlying concrete were, no doubt, thoroughly saturated with water, and their resistance thereby diminished.

Since the Bournemouth accident, I have carried out, with the assistance of the Instructor in Electricity at the School of Military Engineering, Chatham, some experiments to determine the rate of fall of potential on the surface of the ground produced by charging a pipe under similar conditions. The results of these experiments are detailed in a joint paper communicated to the Royal Society, and published in their proceedings.* They fully confirm the view I took of the nature of the Bournemouth accident, which has been repeated in this case. The cause of the fatal shock to the horse, and of the comparative immunity of human beings, is fully stated in the report and paper above referred to.

To remove this particular danger, the whole system of iron pipes enclosing high-pressure mains must be thoroughly connected together, and additional precautions, which are detailed below, should be taken to prevent any possibility of a discharge from mains to pipes. The duty of providing against this danger is distinctly imposed upon the Company by Regulation 8; and they should not have permitted short lengths of pipes containing high-pressure mains to remain isolated.

5. I consider that there was a distinct failure to comply with Regulation 7; and I had previously brought this matter to the notice of the Company. It had also been brought to their notice by the Engineer to the City authorities. It happened that in this case the low-pressure conductors did not become dangerously charged, and they do not appear to have been damaged either by the electric arc or the explosion. But the strong metal casing would probably have protected the cable against injury to the insulation, and even in the event of a breakdown would have much reduced the chance of accident by making a metallic connection from pipe to pipe across the street-box. If an arc had been formed at all under these conditions, it would have been a much smaller one; and time would have been given to cut off the pressure before the arc had eaten its way through the metal of the casing, or for the fuses to act, had they been sufficiently sensitive. The Company now propose to encase the high-pressure mains across all street-boxes by wrapping them with several layers of stout copper strip continued into the pipes at each side; and this precaution alone will, in my opinion, considerably reduce the risk of similar accidents.

6. The question of the accumulation of gas in the conduits and street-boxes of the Company is the most difficult to deal with of all the questions raised by this accident. The danger is a well-recognized one; and Regulations 14 and 15 impose upon the Company the duty of efficiently protecting their conduits and street-boxes against such accumulation. That this duty had not been adequately performed had been forcibly demonstrated by several previous explosions. One of these—the double explosion on Jan. 8, 1894, was investigated by me; and the Board of Trade called the attention of the Company to the fact that they were not adequately complying with Regulation 15. The Company thereupon informed the Board that they were maturing a scheme of ventilation for their conduits.

At this inquiry, however, it appeared that no means of ventilation had as yet been provided. What has been done is to keep two men constantly employed inspecting street-boxes, and reporting any accumulation of gas. These reports have been forwarded to The Gaslight and Coke Company; and in many cases the information thus supplied has enabled leakage of gas to be detected. Since the accident, the number of men employed in opening the street-boxes has been increased to 12.

It certainly appears that, up to the time of the occurrence of the recent accident, the Company had not displayed sufficient vigour in dealing with this very important matter. But it must be admitted, as some excuse, that there is at present some diversity of opinion as to how, in cases where the soil is heavily charged with gas by leakage from the gas-pipes, it can be best prevented from accumulating in the conduits of the electric lighting companies. Thus, at the present inquiry, Mr. D. Cook, on behalf of the Electric Lighting Company, gave particulars of a scheme of thorough ventilation which they were prepared to adopt; while Mr. Foulger, who appeared on behalf of The Gaslight and Coke Company, stated that, in his opinion, this system of ventilation would be dangerous, and General Webber gave it as his view that the pipes and conduits should be plugged at each street-box so as to prevent percolation of gas—thus making thorough ventilation impossible.

The Company have a very extensive network of pipes occupied with their own mains; and they have also numerous spare pipes laid in communication with the same street-boxes, and intended, I understand, to accommodate telephone wires. The whole length of their pipes and conduits exceeds, I am informed, 700 miles. In my opinion, a system of thorough ventilation of all street-boxes by natural or forced draught should be provided; and, in addition, everything possible should be done to prevent the entry of the gas by making the sides and bottoms impervious. Also the air capacity of these boxes should be reduced, where practicable, by filling them with incombustible material. At the same time, the system of regular inspection should be continued, and immediate notice of any leakage of gas detected given to the Gas Company, who appear to take a very reasonable attitude in the matter, and expressed through Mr. Foulger their desire to render all the assistance possible towards the prevention of any further explosions. In the provision of ventilating-pipes, it will be necessary to consider the possibility of the ignition of the gas issuing from these pipes. If they are attached to houses, they should in all cases be carried up above all windows; and if they are erected in the streets, the orifice should be at least 8 feet from the ground.

So far I have dealt with the immediate causes of the accidents and the mistakes made; but it is, I think, desirable also to draw attention to the fact that the work of the officials of this Company has been lately carried out under very difficult conditions. The Company commenced business with two so-called "pioneer" stations, and have erected and partially equipped the new generating-station at Bankside, in order to be able to efficiently meet the rapidly-increasing

* A copy of the paper is appended to the report.—ED. J.G.L.

demand for electric light. In this station, nearly the whole of the plant and equipment is of novel design and unusual size and power, and the difficulties met with in the thorough testing and adjustment of this must naturally have been considerable. Before, however, the station was completed—before much of the plant had even been erected, still more before it could possibly have been thoroughly tested, and the adaptation of each part for its required action sufficiently studied by those who were to use it—the work of supplying electric energy to the City of London was thrown upon the new station. The whole of the operations connected with the transfer of the load had to be carried out without interfering with the continuity of the supply; and at the same time the system of the distribution-mains was largely added to and remodelled.

It is certain that, in this transition stage, risks were run—risk to the apparatus, risk to the employees of the Company, and, as has been practically demonstrated, risk to the public. Here, I think, we have the real element of danger, and which may, if not properly guarded against, occasion even more serious accidents. The same unfortunate experience has been the fate of other electric lighting companies. More especially are companies using a high-pressure system liable to become involved in the difficulties of a transition stage, since they are able to start with a very small capital expenditure, and yet carry the supply over a large district, picking up a customer here and there, while with low pressure this is impossible.

I will now summarize the precautions which should be taken by the Company to prevent a recurrence of the accidents which form the subject of this inquiry.

1. In the first place, greater care is necessary in the testing and identification of new cables before connecting them to the high-pressure system.

2. Every new cable should be connected to the charged system in the first instance through a fine wire fuse, to be kept in circuit for at least two hours before any working current is passed through it.

3. Prompt action of the safety fuses should be secured by properly proportioning them to the working currents, and, if found practicable, by the use of more sensitive fuses at times of light load.

4. The interconnecting mains between converting-stations should be kept out of circuit, except where, in any case, they may be absolutely necessary to maintain the supply; so that in the event of a breakdown of a main, current shall not be supplied to the fault from both ends—thus rendering the action of the safety fuses uncertain.

5. Suitable indicators should be provided, at the generating and converting stations, of the current passing in each main and branch connection, and especially of the pressure between the outer conductors and the earth, unless the Company prefer to provide against the possibility of this pressure becoming large under any conditions by making an efficient connection of all the outer conductors to earth at the generating station. Of course, this can only be done with the approval of the Board of Trade, with the concurrence of the Post-master-General. This approval has been already obtained by the London Electric Supply Corporation and several other companies using concentric cables. Such an earth-connection seems so far to have had no ill results; and it is certainly of great value in the interests of the public safety.

6. All high-pressure mains, where they pass through street-boxes, should be enclosed in strong metal casing extending some distance into the pipes at each side, so that the whole length of main shall be enclosed within metal which is in connection with earth throughout its length.

7. Accumulation of gas should be prevented by thorough ventilation, by making the sides and bottoms of street-boxes impervious to gas, and by filling up boxes as far as practicable with incombustible material.

8. Finally, while the Company's arrangements for generation and distribution are still in a transitional stage, and while new and untried apparatus has to be brought into use, the very greatest care, and the closest possible supervision are necessary. There is, I think, reason to hope that the Company have now nearly completed the task of getting their system into proper working order; and if the precautions I have specified above are thoroughly carried out, I do not consider that there will be any further cause for anxiety as regards the public safety.

The first appendix to the report consists of the following return, furnished by the City of London Police, giving particulars of explosions in electric light boxes in their district from Oct. 14, 1892, to Nov. 10, 1894:—

Date.	Time	Place.	Particulars of Occurrence.
Oct. 14, 1892	8.55 p.m.	Great Tower Street .	No person injured.
Jan. 8, 1894	10.5 a.m.	St. Paul's Churchyard	No person injured.
Jan. 8, 1894	10.5 a.m.	Ludgate Hill, by Creed Lane	Youth injured and taken to St. Bartholomew's Hospital; then removed home suffering from shock.
Mar. 14, 1894	8.0 p.m.	Cheapside	No person injured.
Nov. 10, 1894	1.20 p.m.	Cannon Street, by Budge Row	Six persons injured, and horse attached to brougham killed.

Report on the Euston Road Explosion.

Major Cardew has also presented to the Board of Trade his report on the two explosions which occurred in electric light conduits on the south side of the Euston Road on the 29th of December last, respecting which he held an inquiry on the 10th ult., as already reported (p. 132).

After making a few introductory remarks, Major Cardew explains that the supply of electrical energy for lighting and other purposes in the district is in the hands of the St. Pancras Vestry. He then goes on to say that the greater portion of their system of mains consists of bare copper strip, supported on porcelain insulators, fixed about 6 feet apart, with intermediate distance-pieces, in a conduit which in general is constructed of brickwork and cement concrete; but in portions at road crossings, or where sufficient depth is not obtainable to suit this construction, the conduit is formed by means of a cast-iron pipe 8 inches in diameter. At intervals, street-boxes, formed of brickwork in cement, and closed with an iron cover, filled in with York stone, give access to the mains, which are laid on the three-wire system. Major Cardew gives a general account of the explosions, and proceeds as follows:—

According to the evidence of Mr. Baron, the Chief Engineer and Manager of the St. Pancras electric lighting station, and from my own inspection, I find that the street-boxes in which the explosions occurred were numbered 26A and 27. They are about 10 yards apart; and the conduit between them is an 8-inch iron pipe. The upheaval of pavement took place west of No. 26A, where the brickwork and cement conduit is in use. No external disturbance was apparent above the iron pipe. I had the whole length of this pipe exposed to view, as it appeared to me that possibly electrolytic action might have been in progress from a connection between one of the mains and this short length of pipe, and that this might have damaged the service-pipes or mains of gas or water in the immediate proximity. There was, however, no trace of any such action. The brickwork conduit had been seriously damaged; the top being mostly shattered, and the bottom cracked to a considerable extent. The length of the portion so damaged is about 30 yards. The whole of this was opened up; and I closely inspected the conductors, but could not discover any sign of electrolytic action, or of any electric arc or short circuit, having taken place. In fact, these conductors are practically in as good condition as when first laid.

At several of the insulators, more especially in the street-boxes, there was an incrustation of a saline material in the vicinity of the negative conductor. This was distinctly damp, and no doubt would cause in the aggregate a serious leak. The tendency to the formation of this incrustation in the case of bare conductors used for electric lighting currents has been observed in several previous cases. The insulation resistance of this section of the mains was taken by Mr. Thomas, the Outdoor Inspector, the day after the explosion, and was found to be only 330 ohms for the negative, and 110 ohms for the intermediate mains, in a short length of about 100 yards. That such a very low insulation as this is not an exceptional case on this system of mains is evident from a copy of a report on some tests of mains handed to me by the Chief Engineer, by which it appears that, in May and June last year, the insulation of the negative main in sections in or about the Euston Road was found as low as 150 and even 80 ohms, while in other parts very low insulation of this main was found—in one case only 40 ohms.

The Chief Engineer stated that he smelt coal gas, immediately after the explosions, in street-box No. 27, in which the second explosion took place. Mr. Thomas stated that he detected a strong smell of gas in a neighbouring street-box (No. 26) on the 30th, and also on the 31st of December, when he drew the attention of Mr. Gunyon, the Engineer to the London County Council, to the smell, who also perceived it. Edwin Benyon, an electrical jointer in the employ of the Vestry, also smelt gas in No. 26 immediately after the explosion.

It appears that the street-boxes are systematically examined, for the presence of water or gas, at intervals of from four to six days, and that gas was reported in No. 27 on the 13th of December. On the other hand, both No. 26A and No. 27 had been examined on the 28th, probably about 36 hours before the explosions took place, and were found free from gas. Mr. Foulger, the Engineer of The Gaslight and Coke Company, stated that the tests made by his Company since the explosion had failed to indicate any leakage of gas in the neighbourhood; nor could I detect any smell on the 31st, or on the day of the inquiry. Since the inquiry, however, Mr. Foulger has informed me that a 4-inch main was found to be leaking on the 9th of January, near the entrance to the London and North-Western Railway Terminus, Euston Square; and, from information received from the Vestry, it appears that the position of this leak was about 80 yards from the electric light conduit. The electric lighting officials admit that they frequently discover accumulations of gas in their street-boxes; and a return furnished by the police gives particulars of six explosions, all of which were probably caused by the firing of an explosive mixture of gas and air in connection with the electric lighting mains in St. Pancras.

It has been suggested that, in the particular case now under consideration, the explosive gas was derived from the sewers; but I do not think this at all a probable explanation. Mr. Foulger suggested at the inquiry that the gas might have been hydrogen generated by electrolytic action. This is certainly a more tenable proposition; and I took care to examine the conduits and conductors for any material evidence which might support it. No trace of such action was, however, discoverable.

After careful consideration of the evidence and of my own investigations, I am of opinion that the explosions were caused by the firing of a mixture of coal gas and air by an electric spark. I account for the presence of the coal gas by leakage from the mains of The Gaslight and Coke Company, at one or more points in the vicinity of the electric light conduits; percolation of the escaped gas along the lines of gas and electric mains, which are parallel and in close proximity, where the soil has been frequently disturbed; and entry into the electric conduits and boxes, wherever small openings may exist, which, from the construction and materials used, will certainly be the case at many points. The gas would naturally percolate into the open space provided by the electric light conduit; and this would be facilitated to some extent by the small amount of heat produced by the electric current in the mains.

It is probable that since the general adoption of wood pavement, and other forms of pavement which prevent the escape of gas from the soil directly into the open air, the danger of its percolating into underground chambers has been materially increased. The means provided by the Vestry for the immediate escape of any gas from their conduits are, in my opinion, totally inadequate; and even slight leakage of gas into the conduits would be likely to accumulate until the proportion of gas in the air reached that necessary to form an explosive mixture.

The occurrence of an electric spark was, I think, probably a result of the formation of the salt incrustation on the insulators, as mentioned above. This, no doubt, acts to some extent as a conductor; and if a piece breaks away, a small spark would very likely be caused.

There are many other ways in which an electric spark might have originated, especially with this system of mains; but, from my examination, I think the cause suggested above the most probable.

It is true that, at about the time of the explosions, the electrician on duty at the generating station observed a momentary fall of pressure, which probably indicated a sudden rush of current lasting for a very short time. But I am inclined to consider this occurrence as an effect rather than a cause of the explosions, since I could find no trace of any electric arc. It is possible that the intensely heated gases of the explosions may have allowed of the passage of a considerable current, and a number of partially conducting bridges of solid materials may also have been formed during the progress of the explosion, connecting the oppositely charged mains

The Vestry of St. Pancras should lose no time in removing the two existing causes of danger which I have indicated above—viz, the possibility of an accumulation of coal gas in their conduits, and that of the occurrence of an electric spark at their bare conductor mains. This system of mains and conduits was selected, I believe, mainly for economical reasons, and no doubt it has advantages in this respect; but these economical advantages must not be reaped at the expense of the safety of the public using the streets. The Vestry were, I understand, advised by Professor Robinson, after the serious explosion which occurred on Jan. 12, 1894, in a street-box in Endsleigh Gardens, close to the position of the recent explosions, to carry out a system of efficient ventilation wherever possible. In a report on this accident, which was forwarded to the Vestry by the Board of Trade, I also advised this; and I further recommended that, where possible, two small chambers should be substituted for the large ones at present in use as street-boxes, and that the low insulation of the negative main, which was then, as now, a very noticeable defect, should be remedied. Sufficient attention has not, I consider, been paid by the Vestry to these recommendations. It was stated by Mr. Baron at the inquiry that there are only eleven ventilating-pipes and three ventilating-covers to street-boxes for a total length of $6\frac{1}{2}$ miles of conduit; and the nearest ventilating-pipe was about 300 yards from the scene of the explosion. None of the large street-boxes have, it appears, been divided into two smaller ones, as suggested by me; and the attempts made to remedy the serious leakage on the negative main have not so far been successful.

I am of opinion that the Vestry should immediately provide a thorough system of ventilation, or means for the immediate escape of gas from their conduits and street-boxes; should reduce the empty space available for accumulation of gas in their street-boxes as far as possible; and should carefully guard against the dangerous formation of an incrustation of salts on the insulators of the negative main by frequent inspection, and by protecting these insulators against drip from the condensation of moisture on the iron lids of the street-boxes.

Appended to the report is the following return (referred to therein), furnished by the Metropolitan Police, giving particulars of all cases of explosions known to them to have occurred in the street-boxes and culverts within the St. Pancras district since Jan. 1, 1890:—

Date.	Time.	Place.	Particulars of Occurrence.
Oct. 18, 1891	5.50 a.m.	Tottenham Court Rd.	Plate of a manhole broken, probably by being forced out of the aperture by foul air.
Dec. 1, 1891	5.10 a.m.	Endsleigh Gardens & corner of Euston Rd.	Cover of manhole blown out by escape of gas, which exploded with a loud report. No personal injury.
Dec. 28, 1892	10.30 a.m.	Cumberland Terrace.	Iron covers of culverts blown out by an accumulation of gas in the culvert.
Dec. 29, 1892	12.20 a.m.	Cambridge Place . .	Iron cover of culvert blown out by an accumulation of gas in the culvert.
Jan. 24, 1893	4.59 p.m.	Euston Rd. (near George St.) . . Euston Rd. (near Melton St.) . .	Switch-door to electric light post blown off its hinges and shattered by an accumulation of gas in the culvert.
Dec. 29, 1894	12 night	Endsleigh Gardens & corner of Euston Rd.	Two iron plates to manholes blown out, supposed by an accumulation of escaped coal gas in electric channel. Two persons slightly injured, and flagstones displaced for 40 yards.

The Explosion on Southwark Bridge.

An inquiry into the circumstances attending the explosion on Southwark Bridge on the 1st inst., noticed in our "Electric Lighting Notes" last week, was held by Major CARDEW at the Guildhall on the 4th inst.

Mr. H. HOMEWOOD CRAWFORD (the City Solicitor) appeared for the Corporation, the Trustees of the Bridge House Estates, who own the bridge, and the Commissioner of Police; Mr. F. BAILEY, the Chief Engineer of the City of London Electric Lighting Company, Limited, represented them; and Mr. FRANK LIVESEY, the Chief Engineer of the South Metropolitan Gas Company, attended the inquiry on their behalf.

Police-Constable *Sawyer* said that, about 1.50 p.m. on the day of the accident, he was on the west side of Southwark Bridge, going north, when he heard an explosion behind him. As he was turning round, another occurred. He saw three clouds of smoke rising, and a man lifted several feet into the air. He afterwards took the man to Guy's Hospital.

Several other witnesses gave corroborative evidence; one of them adding that he saw several flagstones thrown into the air and a woman knocked over. Almost directly afterwards, the cover of a street-box on the other side of the bridge blew up with a loud report, accompanied by some light blue smoke.

Police-Inspector *Eve* said that, shortly after 2 p.m. on the day in question, he was on the bridge with officials of the Electric Lighting Company. They went to the iron box-lid at the south-east corner of the bridge, and lifted it. There was a strong smell of gas in the box, which contained a gas-meter. They then went to a similar box with a meter on the west side, where there was also a strong smell of gas. He at once despatched a constable to give information to the officers of the Gas Company.

Mr. *W. Cupit*, an outdoor foreman of the South Metropolitan Gas Company, stated that about three o'clock on the afternoon of the accident, he opened the road at the south-west corner of the bridge, and found a 3-inch main cracked about half-way round, and split lengthwise some 6 inches. The crack was about the thickness of a sheet of paper. It was centrally over a culvert which passed across the roadway. The main was about an inch above the electric mains. The crack round the pipe might have been causing a leakage for two or three days, or it might have been made by the explosion.

Mr. *R. Thompson*, in the service of the Electric Lighting Company, said he last examined the boxes on the bridge on the 25th ult., and there was then no smell of gas in them.

Mr. *J. P. Buck*, the superintendent of street work for the Company, said, when the explosion was reported to him, he went to the bridge, and found there was a strong smell of gas coming from the manhole and the gratings. The electric mains were uninjured excepting a few dents caused by stones. Twelve men were constantly employed in searching for gas in the electric light boxes.

Mr. *T. Blythe*, foreman to Messrs. Mowlem and Co., said that in January his employers were engaged by the City Architect to carry out the construction of new gullies on the bridge—one on the east side and one on the west side at the south end. He cut away the brickwork from the old grating above the culvert, and close to the gas-pipe; but he did not touch it. They did not go near the particular part of the pipe found cracked. He thought the frost and rain might have caused the crack in the pipe, owing to its being so close to the surface.

Mr. *F. H. Jackson*, in charge of the Electric Lighting Company's machinery, produced an automatic volt meter record, showing that at the time of the explosion, there was no indication of any disturbance at the Company's works.

Mr. *Livesey* said it was impossible to prevent all escapes of gas. They had many difficulties to contend with in connection with this matter; one of them being the heavy steam-rollers. Although their mains had, to a great extent, been placed deeper since these rollers were first brought into use, the Company could not relay the whole of their mains, as this would mean taking up all the streets in South London. Then the sewers were made underneath their mains; and pipes were sometimes broken in this way. He could not suggest any reason for the explosion. Generally, when there was an accident of the kind, they were able to trace a light to some point; but in this case they had been unable to do so.

The proceedings then terminated.

Death from Gas Poisoning at Huddersfield.—Lewis Woodhead and Friend Matthewman, both about 40 years of age, went on Monday night last week to the house of Mrs. Ellen Wilkinson (Woodhead's sister) at Ark Hill, Huddersfield, and stayed there the night. They occupied a bedroom about 8 feet square; and there was a small wall gas-bracket over the bed. On the following morning Mrs. Wilkinson went to waken them, but received no answer; and, on entering the room, she found both men unconscious, and a strong odour of gas. She opened the window, and at once sent for medical assistance. Woodhead was successfully restored to consciousness, but Matthewman expired—the cause of death being suffocation by inhaling coal gas. It is believed that when the gas was extinguished, the tap was turned too far, and so permitted gas to escape.

A Large Gas Carving-Table and Hot Oven for a Co'onial Hotel.—The *Daily Telegraph* of Napier (N.Z.), dated Dec. 21, 1894, says: "Mr. F. Moeller, of the Masonic Hotel, has just imported, through the Gas Company, from Messrs. R. and A. Main, of Glasgow and London, a large hot carving-table and hot oven. The table is constructed of strong polished copper, tinned inside, with four tinned copper carving removable recesses; also pudding and vegetable boxes, soup and sauce dishes, and a special urn for coffee. All the vessels are of copper, heavily tinned inside; and the covers for the different recesses are of silver-plated metal. The entire top is a hot-water chamber; thus keeping the joints and other eatables warm. The hot oven is constructed of strong panels, and is specially heated for plate-warming; provision being made for keeping about 300 plates warmed ready for use. This is the largest appliance of its kind at present in the colony; and it contains all improvements up to date."

The Representation of Workmen and Consumers on the Directorate of Gas Companies.—"The *Globe* has taken alarm," says the *Daily Chronicle*, "at a rumour that the South Metropolitan Gas Company intend to provide for the election of a director to represent their workmen in their new Bill. While we agree that this would be a new departure of a very remarkable kind, we do not see why the shareholders should be called upon to get up a panic about it. The *Globe* fears that 'Trade Union agitators, and persons of that kind,' would bring pressure to bear upon the new director, who in his turn would, presumably, coerce Mr. Livesey and his colleagues into measures of a revolutionary sort. As a matter of fact, Mr. Livesey will not employ trade unionists if he can help it; and his record shows that he is quite a match for the 'agitators.' For our own part, we think the proposal an excellent one; and we should not be disposed to grumble if the Gas Companies invited representatives of the consumers as well as the workers to a place on their Boards. But for that happy day, we shall probably have to wait until the County Council has acquired the gas undertakings."

MANCHESTER CORPORATION GAS AND ELECTRICITY SUPPLY.

A General Reduction in the Price of Gas—The Abolition of Meter-Rents—The Charge for Electricity.

At the Monthly Meeting of the Manchester City Council last Wednesday—the LORD MAYOR (Alderman Lloyd) presiding—there was a protracted and animated debate on the proposals of the Gas Committee that the charge for the hire of gas-meters within the city be abolished from the end of the current financial year, and that the price of gas used within the city for other than lighting purposes be reduced from 2s. 6d. to 2s. per 1000 cubic feet.

Alderman GIBSON, in moving the adoption of the recommendations, first expressed the opinion that the Council had acted wisely in placing the gas and electric light undertakings under the direction of one Committee; for otherwise these two enterprises, which in their separate spheres were capable of helping each other, would have become severe competitors, and would in the end have rivalled the performances of the Kilkenny cats. The Committee proposed to reduce the price of the electric current from 8d. per unit to 6d. to small consumers. They also wished to do away with the charge for the hire of meters, and to lower the price of gas used for other than illuminating purposes. In other words, they were suggesting the division among their customers of no less a sum than £25,000 a year, and without asking the Council to relieve them at all from the responsibility they had undertaken to pay over to the City Fund £50,000 a year towards the reduction of the rates. He had never regarded the charge for meters as oppressive; but he had come to the conclusion that it was a deterrent. He believed there were 20,000 small houses in Manchester which would have gas in them if it were not for this little deterrent in the shape of 6d. a quarter for the hire of a meter. One of his colleagues had said that the Committee had 25,000 customers whose accounts cost more to collect than they were worth; but, with all due deference to his friend, there was, he thought, no greater fallacy. They all knew that it was the large number of small customers who formed the backbone of large businesses. He believed, if they adopted this resolution, it would lead to an enormous increase in the production and consumption of gas. It might be urged that the Committee should reduce the price of gas all round 3d. But if that were done, it would mean an increase of the rates; and he would be a bold man who proposed such a thing at the present time. The reductions now projected would lead to a largely increased consumption of gas for purposes other than lighting; and this would enable the Gas Committee to employ a great many additional men at the gas-works whom they could not employ now, because there was not work for them to do. He attached considerable importance to the latter consideration. In two years from now, he anticipated that, if the Committee's proposals were acceded to, they would sell one-third more gas than at the present time. Last year the Committee carbonized 360,000 tons of coal, at the gross cost of £390,000, or in other words, at a cost of £1 1s. 8d. per ton. This was done with a fixed charge of £90,000—that was to say, that for every ton of coal carbonized the cost was 5s. per ton for fixed charges, and 16s. 8d. for coal and labour. If they could carbonize one-third more—120,000 tons of coal more, or 480,000 tons altogether (as they could do if the Council would permit them to conduct their business as they considered would be for the advantage of the community)—they could do this with the same plant and material, and at the same fixed charges. They would thus be enabled to carbonize 480,000 tons of coal for £490,000; or, in other words, at a cost of £1 0s. 5d. per ton. By this means they would save 480,000 times 1s. 3d., which was equal to £30,000. He thought, therefore, the Committee had some justification for saying they could not only distribute £25,000 a year among their customers, but they could do it without asking to be relieved of their responsibility with regard to the £50,000 that they now paid in reduction of the rates.

Alderman HIGGINBOTTOM, in seconding the motion, referred to the third point in the recommendation of the Committee—viz., that the price of electricity should be reduced from 8d. to 6d. per unit to the short-hour consumer. The Council were aware that the demand for electric current had been so great that the Committee were authorized to make application to the Local Government Board for powers to borrow £100,000 for the extension of the plant; and arrangements had been made for laying down that plant on approved principles. The revenue for the year in this branch of their business had gone up by leaps and bounds, and had amounted to £26,629, which, considering that the light had only been in use for about a year and eight months, was a very satisfactory result. The expenditure had been £10,576, or a gross balance of profit of £16,053. Interest on the sum of £160,000—sinking fund, depreciation, &c.—made up a sum of £8283, leaving a net profit, applicable to the reduction of the city rates, of £7730. The Committee did not propose to hand over the whole of this sum, however, but to place £1730 to the reserve fund and £6000 to the reduction of the rates. The reduction proposed by the Committee in the supply of the electric current would, he believed, lead to its largely increased adoption.

Alderman THOMPSON was not fully convinced as to the wisdom of the Committee's proposals, and would remind the Council that their first consideration should be the ratepayers. The gas consumer was here to-day, and might be gone to-morrow; but the ratepayer remained.

Alderman GRANTHAM proposed, as an amendment, that the meter-rents remain as at present.

Alderman SHAW seconded the amendment.

Alderman HOPKINSON inquired whether the Committee were prepared to provide all meters without rental, and also whether they would supply gas-engines on rental, in the same way as they had been accustomed in the past to supply meters.

Alderman GIBSON replied that the Committee would furnish meters under 100 lights free. They would supply the meter, and keep it in repair. They had nothing to do with gas-engines.

Mr. TUNSTALL, referring to the hardship inflicted upon the small householder, said in the first place the tenant had to pay 2s. 6d. for the meter and for having it connected; and he then had to pay 5s. as a deposit for his gas-rental. For a working man to have to pay this was often equivalent to asking him for half a week's wages. If they meant to make this reduction, they should do it in a liberal spirit, and let the working classes have the benefit of it.

Sir B. T. LEECH thought there was a great deal in what Mr. Tunstall had said. He did not believe the abolition of the meter-rent would produce any great increase in the consumption of gas. The great deterrent was the initial charge, and also the fact that oil was cheap. Then there was the great cost of repairing the meters; and sixpence per quarter was a very moderate sum to pay for rents and repairs.

Alderman SMITH remarked that, if the charge for meters were abolished, it was possible that many people might have them fixed, and not consume any gas.

Alderman RUSHWORTH said he favoured an amendment that the price of gas be reduced generally within the city.

Sir ANTHONY MARSHALL thought the Gas Committee should further consider the matter, and report again to the Council.

Alderman GIBSON said the Gas Committee had agreed, without a single dissentient, in favour of the abolition of meter-rents; and he thought the Council might come to a decision now. All he stipulated was that the Council should not reduce the price of gas as proposed by the Committee, unless they reduced or abolished meter-rents.

Mr. SMALLMAN observed that they did not care as a rule to go to Salford for instruction; but he ventured to say that, in this instance, they might do so with the best possible advantage. In Salford the abolition of meter-rents had led to a great increase in the number of applicants to be supplied with gas. Before the abolition of the rents, the number of applications per annum was about 300; in the first year after, the number jumped up to 1000.

Mr. MAINWARING endorsed the action of the Committee touching the abolition of meter-rents, but deprecated the proposal to reduce the charge for gas for other than lighting purposes. If any reduction were made, it ought to be in favour of the old consumers.

Alderman GIBSON appealed to the Council to take the steps he now proposed. They would thereby be removing an impediment out of the way of an increase of business. He wanted to put a "penny-in-the-slot" meter in every cottage, if the tenant would have it; and he believed that in a short time fully 20,000 more householders would be users of gas.

The amendment was then put, and lost by a large majority.

Mr. RICHARDS next moved that, in addition to the abolition of meter-rents, the price of gas be reduced 3d. per 1000 cubic feet all round within the city.

Mr. M'CABE seconded the amendment.

Alderman MARK urged that the reduction of 3d. should extend to consumers outside the city boundary. That would still leave a difference of 6d. per 1000 cubic feet between the charges to citizens and non-citizens.

Mr. ROYSE feared the Council were losing sight of the important question, Where is the money to come from? A reduction of 3d. all round would take £33,000 from the revenue of the Gas Committee. If they were to get a large demand for gas for motive power and heating purposes, they must lower the price to 2s. At that price, he believed they would be able to largely increase their output; but he did not think a reduction of 3d. all round would lead to an appreciable increase in the use of gas for other than illuminating purposes.

Alderman GIBSON said he wanted the Council to understand clearly that if they did agree with the proposal to reduce the price of gas 3d. per 1000 cubic feet all round, it would mean that they would put 4d. in the pound on the rates.

Mr. HAMPSON thought it was too late in the day to go in for class legislation. This proposal to distinguish between gas consumers meant pandering to the well-to-do, and overlooking the middle and lower middle class. If the present proposal were adopted, it would necessitate the provision of 10,000 more meters, the opening of an equal number of new accounts, and would entail a great deal of labour in other ways. The object of the Gas Committee should be to bring gas into competition with oil, and to abolish meter-rents.

The amendment moved by Mr. Richards—abolishing meter-rents, and reducing the price of gas to consumers in the city from 2s. 6d. to 2s. 3d. per 1000 cubic feet—was carried by 63 votes to 14.

Alderman MARK then submitted a further amendment—that the price be reduced 3d. to consumers outside as well as within the city. He proposed this in the interests of justice and equity, believing that a differential rate of 6d. was quite large enough.

Mr. WILSON seconded the amendment.

Sir J. HARWOOD said he did not think, in its present humour, the Council should pass Alderman Mark's proposal. He thought it would be better that it should go as a suggestion to the Gas Committee. He was quite certain that, on mature consideration, a differential rate of 6d. per 1000 feet could be maintained. They could only expect the loyalty and goodwill of the out-townships so long as they dealt reasonably with them; and it was unreasonable, upon the face of it, to fix the price at 2s. 3d. for Manchester while another person across the street was charged 3s.

After further discussion, this amendment was also carried.

LEEDS CORPORATION GAS SUPPLY.

The Superintendence of the Department—Purchase of Additional Land.

The above questions were under consideration at the meeting of the Leeds City Council last Wednesday. Mr. Tweedale, in moving the adoption of the minutes of the Gas Committee, stated that they proposed that for the position rendered vacant by the death of Mr. James Lupton, the Council should appoint "a man of business ability, capable of negotiating with contractors, and with a general knowledge of a gas undertaking, the salary to be £300 a year." Mr. Graham seconded the motion. Mr. Lowden thereupon said he should have been better pleased if they had proposed to appoint a gas engineer. The Water and Sanitary Committees and other departments always had the benefit of professional aid; and he held it was equally desirable that

professional skill should be brought to bear upon the gas undertaking. Considering that a salary of £300 would not tempt men of the capacity required, he moved that they offer £400 a year. Alderman Atha held that the gas managers were quite capable of taking care of the manufacture of gas in their respective works. What they required was a commercial man. Mr. Leuty pointed out that they had men in their service who had earned promotion, and were worthy of it; and, this being so, he did not see why an outsider should be brought in. Mr. C. Wilson was in favour of the appointment of a gas engineer; and, failing that, he would vote for a salary of £400. Alderman Holdsworth expressed himself as opposed to the appointment of an engineer. The Mayor (Alderman Gilston) informed the members that one of their servants was on the point of applying for the post of gas engineer in a large undertaking; and he was as capable of filling that position as nineteen out of twenty. His opinion was that they required a man not so much to look after the bookkeeping, but as a confidential man, able to conduct the commercial business of the department. Some knowledge of the chemistry of the undertaking would also be advantageous. The minutes of the Committee were adopted. The Council also approved the purchase by the Committee of land, with buildings thereon, near the Wortley Gas-Works, comprising 655 square yards, for the sum of £2050; and adjoining land, comprising 825 square yards, for the sum of £1200.

A practical gas manager has addressed a letter to the *Leeds Mercury* in which he asks whether the Leeds Corporation Gas Committee are acting wisely in the steps which they are taking to fill the office of Superintendent of the Gas Department. On looking at the last published returns of the Board of Trade, he finds that 2,503,544,000 cubic feet of gas are manufactured at Leeds per annum, but only 2,220,721,000 cubic feet are accounted for. What, he asks, has become of the difference of 282,823,000 cubic feet? If this is described as "leakage," then, surely, the matter is one of enormous importance. Calculating the 282 million feet at the cost of production in Leeds (which is practically the selling price of gas—viz., 2s. 2d. per 1000 feet), it amounts to £30,550 lost to the city per annum on this item alone. Looking at it another way, 251,503 tons of coal are carbonized per year, from each ton of which 9954 feet of gas are extracted, but only 8829 feet sold—a loss of more than 1100 feet per ton. What wonder then, says the writer, that the returns state the last profit as "£3141 towards reduction of previous losses." Are there, he also asks, any other items that may not be susceptible to an improvement in the management? What quantity of coke per ton of coal carbonized are they selling? What quantity of tar per ton of coal are they making? What is the amount of ammoniacal liquor made per ton of coal? And, finally, are these two last products sold in the raw state to the manufacturing chemist, or are they worked up by the Committee as they should be? To this last question, he can answer, "No;" but to the preceding, he is in the dark. The letter proceeds: "I ask, would any body of practical business men hand over an immense concern like the above to a chief clerk and superintendent, at a wretched salary of £300 per year? By the way, I never heard previously of any clerk possessing the qualification of superintendent, of gas-works. What is wanted is a first-class gas manager of repute, one who to a good experience of gas making can add the practical knowledge of working up his residual products. Let the Committee engage a gentleman of this description at a commencing salary (say) of £1500 per annum; or, if they do not care to give this sum, let them give him no salary at all, but a commission, say, of 25 per cent. on all profits he can make beyond what they at present average. If they will do the latter, I am sure that, speaking both reasonably and moderately, the result would prove a fortune to any gas manager of first-class ability."

The above letter served as the foundation for a good deal of letter writing in our contemporary; among the correspondents being Mr. R. Smith, the Manager of the Corporation New Wortley Gas-Works. He says it is not usual for a practical gas manager to be afraid of signing his name to a communication to the Press; and such a course carries with it the conviction that the argument is valueless. He asks the writer of the letter to forward to him copies of his balance-sheets for the last two or three years, showing the quantity of gas produced per annum, the make per ton of coal, the illuminating power of the gas, and by whom it is tested, the length of mains and service-pipes, the leakage per ton of coal used, the price charged for gas, and the results of his working. If he will give him this information, together with his name, Mr. Smith says he shall be prepared to argue the matter.

THE TRIAL OF OIL-GAS PLANT AT THE BRADFORD GAS-WORKS.

Report on the Experiments with Dr. Dvorkovitz's Process.

Our readers are aware that experiments have been going on for some time at the Thornton Road Gas-Works of the Bradford Corporation with the oil-gas plant erected there for testing the process of Dr. Dvorkovitz. The process has been the subject of various questions at meetings of the Town Council, and latterly of some sharp newspaper correspondence. Now, however, we have a definite pronouncement on the result of the experiments, in the shape of a report by Mr. W. Wood, the Gas Engineer of the Corporation, which has been printed and distributed to the members of the Gas Committee. It is dated the 23rd ult.; and it covers the period from September last (when the trial of the process was commenced) to the 19th ult., when Dr. Dvorkovitz formally notified to the Corporation that the plant was in working order. Mr. Wood's report, which was given in the *Bradford Observer* for Monday last week, is as follows:—

I beg to present to you the following report upon the results of the experiments with the Dvorkovitz oil-gas process at the Thornton Road works.

When the plant was first worked in September last, the pipes for taking off the gas, as well as the condensers and meter, were found too small. It was therefore thought necessary to replace them with larger ones. Other alterations in the oil-feeding arrangements and tar-boxes were made at the same time. The plant was again started on Oct. 23, and worked for a few hours at a time up to Oct. 31, when a continuous run of 17 hours was made. From Oct. 23 to Nov. 2, 2064 gallons of oil were used, and 127,000 cubic feet of oil gas obtained, or 15,500 cubic feet per ton, of 100 candles enriching power; also 808 gallons, or 39 per cent., of bye-products.

Being a new process, it was necessary to try experiments with the retorts at different temperatures and under various conditions, in order to arrive at the best method for regular working. From Nov. 2 to 19, the plant was stopped, as we had no oil. From Nov. 19 to 23, we ran the apparatus for about eight hours daily. In this week, we used 660½ gallons of oil; produced 41,680 cubic feet of oil gas, or 15,900 cubic feet per ton of 109 candles enriching power; and 282 gallons, or 42·69 per cent., of bye-products. In the intervals when we were not making oil gas, experiments were made in carburetting the coal gas, the results of which are given later.

As the bye-products were shown by analysis to contain a large amount of valuable hydrocarbons, Dr. Dvorkovitz wished to try to increase the quantity of these while still maintaining the quality. Therefore, from Nov. 26 to Dec. 15, the retorts were worked at a lower temperature than hitherto. From Nov. 26 to Dec. 15, 4457 gallons of oil were used; 235,560 cubic feet of gas were made, or 13,290 cubic feet per ton, of 102 candles enriching power; also 2174 gallons, or 48·7 per cent., of bye-products. It was found, however, when we made such a large quantity of bye-products, that their quality was not so good. We therefore decided to return to the original method of working, by which more satisfactory results had been obtained.

From Dec. 18 to Jan. 12, we made three tests, averaging 93 hours each; used 3330 gallons of oil; and made 247,200 cubic feet of gas, or 18,639 cubic feet per ton, of an enriching value of 104 candles. The average yield of bye-products was 36 per cent. of the oil used. In the latest tests, from Jan. 15 to 19, 2108 gallons of oil were used; 139,140 cubic feet of gas were made, or 16,533 cubic feet per ton, showing an average enriching value of 105 candles; and also 42 per cent. of bye-products.

Altogether, from the commencement up to Monday, Jan. 21, we received at the Thornton Road works 59 tons 5 cwt. 1 qr. of oil. We have still in stock 7 tons 2 cwt. 1 qr. So that 52 tons 3 cwt. have been used, or about 13,100 gallons; and 801,860 cubic feet of oil gas have been made. Therefore, for the whole period, an average of 15,376 cubic feet per ton has been produced, although this includes several experiments in which we were making from 50 to 60 per cent. of bye-products. It would, however, be altogether unfair to the process to base any calculations upon results obtained from short experimental runs. In the earlier tests, the oil gas was mixed with the coal gas at the outlet of the washer; and it was necessary to stop working, so that tests of the coal gas alone and of the enriching value of the bye-products could be made from time to time. The results obtained during the longer runs have always been higher than in the short runs.

Satisfactory features of Dr. Dvorkovitz's process are, I think, its simplicity, the ease and regularity of its working, and the moderate amount of attention now required. Respecting the permanency of the enrichment by the oil gas, the tests made of this have not shown more depreciation than those made upon gas enriched by cannel under similar conditions. We hope, however, to make further experiments both in storing the gas and in testing it after passing through the street mains. As the bye-products produced contain a larger proportion of unsaturated hydrocarbons having a high illuminating value, experiments were made at Thornton Road in November and December, with a view to determine how they could best be utilized for enriching purposes. Fifteen experiments made upon 11 million cubic feet of gas showed that this quantity of gas had been enriched, on the average, 0·75 candle by the use of 165¼ gallons of bye-products, or that one gallon of bye-products increased the illuminating power of 66,000 cubic feet of coal gas by 0·75 candle. Most of the tests of gas enriched with bye-products were made upon the gas put into the holders during the night, and tested from the holders next morning.

Not feeling satisfied with the enriching experiments at Thornton Road, we tried carburetting the gas at Mill Street with the bye-products. At Mill Street we have enriched over 20 million cubic feet of ordinary gas, but have only been able to get an average increase of about 0·5 candle in illuminating power. The Mill Street tests show that a gallon of bye-products enriched about 40,000 cubic feet by 0·5 candle. Analyses of the bye-products after having been used for carburetting show that they still contain some benzol; so that all the enrichment had not been extracted from them. During the experiments at Thornton Road, careful watch has been kept upon the syphons, both in the works and in the district supplied, to see if any condensation took place; but nothing of the kind has been found. At Mill Street, on the other hand, when using a much larger proportion of bye-products, we have had a considerable quantity of the heavier hydrocarbons again condensed, and deposited in the syphons on the works.

The question of enrichment by carburetting is much more complicated than it would at first seem to be, although several large gas-works in Germany are now doing all their enrichment with benzol. In an experiment with benzol itself at Mill Street, we only obtained an increase of 0·75 candle, though carburetting 28,000 cubic feet of gas per hour with 1¾ gallons of 90 per cent. benzol. This shows, I think, that we have not yet arrived at the best means of utilizing the bye-products, and that it is necessary to experiment much farther with them before we can even approximately say what their enriching value will be.

To see if the bye-products could with advantage be partly re-gasified, an experiment was made on Jan. 12, with some of the average bye-products, and 38 cubic feet of gas per gallon were obtained from them; while the secondary bye-products yielded upon analysis a larger proportion of lighter hydrocarbons than before.

During recent tests, upwards of 500 gallons of oil per 24 hours were used; but reckoning 400 gallons as a regular day's work of 24 hours, the probable cost of working the plant might be taken as follows:—

400 gallons of oil, at (say) 4d.	£6	13	4
Labour—three men at 5s.	0	15	0
Coke—20 cwt., at 7s. 6d. per ton.	0	7	6
Interest, wear and tear, say, 15 per cent. on £750 (300 working days per annum)	0	7	6
Total	£8	3	4

Taking the average yield at 17,000 cubic feet of 105-candle gas per ton, and 40 per cent. of bye-products, we should get per day, from the above quantity, 27,200 cubic feet of 105-candle gas, and 160 gallons of bye-products. If we assume the enriching value of the oil gas and of the bye-products to be equal to the average of the results obtained at Thornton Road and Mill Street, and also that all the bye-products made could be used for enrichment purposes, the total enrichment obtained from the 400 gallons would be—

27,200 cubic feet of gas of 105 candles.	.=	2,856,000 foot-candles.
160 gallons of bye-products × 35,000 „	.=	5,600,000 „
Total		8,456,000 foot-candles.

Or at a cost of £8 3s. 4d. ÷ 8456 = 0·25d. per 1000 foot-candles of enrichment. Of course, if only a small part of the bye-products can be utilized for carburetting, the average cost of enrichment will be proportionately increased.

No allowance is made in the above calculations for the value of the residue from the bye-products after carburetting with them. However, taking the value of the bye-products as made to be 6d. per gallon, at which price Dr. Dvorkovitz states that he is prepared to purchase them while supplying the oil at 4d. per gallon, the cost would be—

Expenses as above	£8	3	4
Less 160 gallons of bye-products	4	0	0
Total	£4	3	4

Or the cost of enriching 1000 cubic feet by one candle would be £4 3s. 4d. ÷ 2856 = 0·35d.

In October, November, and December, 1894, there were 1045 tons, or 10 per cent., of cannel used at the Thornton Road gas-works; and the average illuminating power of the gas sent out during this period was 17·46 candles. We cannot compare this with the corresponding months of 1893, as, owing to the coal strike, many kinds of coal and cannel were used. But in January, February, and March, 1894, we had to use 25 per cent. of cannel; and the average illuminating power of the gas sent out was 17·2 candles. So that 15 per cent., or about 1500 tons, less cannel has been used during the last three months, while only about 35 tons of oil were used to the end of December. During the time that the gas has been enriched at Mill Street with the bye-products, the gas as tested at the Town Hall has improved, although less cannel has been used than previously, both at the Valley Road and the Mill Street works.

Dr. Dvorkovitz on Friday, Jan. 18, officially informed the Town Clerk that the plant had been "brought into efficient use," according to the terms of the agreement. It is necessary, therefore, to make tests of several weeks', or even months', duration, to thoroughly determine the value of the process, and especially of the bye-products obtained in working it.

ELECTRIC LIGHTING NOTES.

The Electric Lighting Committee of the Eccles Town Council last week submitted to the members a recommendation in favour of the adoption of the electric light. It was stated by Mr. Kendall that at present it cost between £1200 and £1400 a year to light the streets with gas supplied by the Salford Corporation, which meant a rate of about 3½d. in the pound. An eminent authority, who had been consulted, had assured them that the streets could be lit for about £780, or that at any rate a saving of something like £300 a year in the cost of public lighting would follow the adoption of electricity. Alderman Mellor was of opinion that the electric light scheme, if adopted, would probably cost £20,000; and as the Council were committed to other expenditure for various works, he thought the time was inopportune for the launching out into further outlay. Other members were also afraid the scheme would be a costly one; but the recommendation was agreed to.

Owing to the overheating of an electric wire, a fire was caused a few days ago at a tobacconist's in West Street, Bristol. It was soon extinguished; not, however, before it had considerably damaged the contents of a room.

At last Wednesday's meeting of the Liverpool City Council, Mr. Williamson moved, and Mr. Petrie seconded, a recommendation of the Lighting Committee "that the Council consent to the application by the Liverpool Electric Supply Company, Limited, for a Provisional Order to carry out the arrangement made with the Company at the inquiry on the proposed extension of the city boundaries, provided such Order is withdrawn if the Order for the extension of the city boundaries is not confirmed by Parliament in the ensuing session, and that the Council object to the application for any other purpose." It was explained that the effect of this recommendation would be that the Company would have two years longer of life if the Corporation bought at the short date; and, on the other hand, the Corporation were relieved of any claim by the Company for compensation for severance of their plant between Liverpool and Toxteth Park. Alderman F. Smith, the Chairman of the Corporation Lighting Committee, opposed the proposal, remarking that the agreement supposed to have been come to by the Parliamentary Committee at the inquiry had not been brought before the Council in that detail to which they were entitled before such an important concession was granted to the Electric Supply Company. Alderman Hughes urged that the terms agreed upon at the inquiry were the best that could be arranged at the time. The Deputy Town-Clerk explained the details of the terms, and said the Lighting Committee were simply carrying out an honourable engagement entered into by the Corporation. The recommendation was ultimately unanimously adopted. Later in the proceedings, Mr. Austin Taylor raised an objection to a resolution passed by the Lighting Committee, that the Council should provide electric light, in competition with the Electric Supply Company, within their own area. The Committee, he said, had received from the Council powers to effect a possible and amicable arrangement for the purchase of the undertaking. The resolution he complained of, however, was passed before the Committee had even given an intimation of their desire to open negotiations, and that course was neither straightforward nor business-like. The Deputy Town Clerk, knowing the policy of the Board of Trade in regard to these Licences, assured them that they had no chance of getting one; and that if they did, they would have to face a serious financial obligation, because the capital had to be repaid within seven years. The case they had to put before the Board of Trade was that they were supposed to negotiate with the Company in a friendly way, and at the same time they were applying for a Licence to compete with them. He moved that the proceedings of the Committee be approved with the exception of the resolutions of Jan. 14 and 21, and that the Lord Mayor be requested to countermand the summons for a special meeting of the Council on March 6. Mr. Petrie seconded the amendment, which was carried; the voting being 18 for and 8 against.

THE FINANCES OF THE LIVERPOOL CORPORATION WATER DEPARTMENT.

The reports and estimates of receipts and expenditure of the Water Committee for the current year were submitted by Alderman T. Hughes, at last Wednesday's meeting of the Liverpool City Council. These showed an estimated expenditure of £283,165, and a revenue from water supply, rates, &c., of £204,777, and £78,387 from domestic water-rents. Sir W. Forwood drew attention to the fact that the Committee began the year 1894 with a credit balance of £28,000, which was reduced in this year's estimates to £237; and he inquired how it was that this large surplus had disappeared. He also desired to know why the receipts were estimated at £8000 less than 1894, when there were no circumstances in the state of business which pointed to a probable decrease. On the other side of the account, £12,000 had been put down for general repairs, as against £10,400; £12,000 for maintenance at Rivington, against £8600 spent last year; and for Vyrnwy maintenance £12,000, against an expenditure of £9095 in 1894. On the total, the estimated expenditure was increased to £99.000, against £85,000 in 1894. This was an advance of £14,000. In addition, the £8000 from revenue added to the £28,000 balance in hand, gave the Committee practically £36,000 to play with. In these hard times, why not, in place of accumulating these large amounts, reduce the water-rate? Alderman Hughes explained that in August next the sinking fund on account of the Vyrnwy works came into operation. That sinking fund meant an additional obligation of £15,000 a year. Yet the Committee had, as far as possible, reduced the charges to the public. For instance, the charge for water supplied to shipping had been reduced from 1s. per 100 gallons to 2s. 6d. per 1000 gallons, or to one-fourth. During the past year, the consumption of water for shipping increased by 10 million gallons; but the revenue went down by £2500. The Committee had also decreased the charge to traders and manufacturers from 7d. to 6d. per 1000 gallons; but, notwithstanding, the revenue had maintained itself, within a very few pounds, thereby showing the wisdom of the Committee's policy. The Committee had been placed under the obligation of providing £15,000 per annum. They would find, for the first time in the history of the Water Committee, they had had to meet this responsibility in the estimates; £8000 had been set aside as the contribution which they would have to pay for that portion of the present year which they would have to cover. It was understood that the public obligations should not be increased by reason of those new works; and the Council had faithfully fulfilled that understanding. They were levying rates and charges similar to those of the last twelve months; and certainly less than those of previous years. After further explanation, the estimates were adopted; and the Council also approved of the estimated expenditure on capital account for 1895, amounting to £101,400.

THE NEW WATER RESERVOIR FOR LANCASTER.

At the last Meeting of the Lancaster Town Council, the Water Committee submitted a detailed estimate of the cost of the proposed new reservoir at Blea Tarn, and of the mains to be laid in connection with it. The outlay for the reservoir, which will contain 120 million gallons, is computed at £37,837 18s.; for mains, £10,757 2s.; land, easements, &c., £5600 15s.; contingencies, £7289 3s.—making a gross total of £61,484 15s. The Committee reported that they had resolved that, for the purpose of obtaining borrowing powers, the estimate be approved, and that the same be submitted to the Local Government Board.

Mr. HUNTINGTON, in moving the confirmation of the minutes, said the estimates proposed to be adopted for the purpose of obtaining borrowing powers amounted to £61,461. He quite expected that some members of the Council would be on the alert to criticize the doings of the Water Committee, because in October, 1893, when he introduced the question of a storage reservoir at Blea Tarn, he stated that the estimate was £35,000. The report of the Surveyor in 1893 was upon information he had at that time. The site of the reservoir then suggested was to be 23 feet below the draw-off level. Sinking operations had since been carried out, with the result that they had found that they could get a depth of water of 45 feet; thus increasing the storage capacity by 20 million gallons. The first estimate was for 100 million gallons; but the present one was for a reservoir to hold 120 millions. The taking out of the bottom of the tarn to the greater extent proposed would involve extra expenditure, and so would the sinking of the outlet. In connection with the reservoir itself, Mr. Mansergh had recommended what meant extra expenditure in connection with the construction of the embankment. They had been advised to increase the size of the inlet-pipe to the proposed reservoir from 12 to 15 inches; and it would be remembered that at the inquiry before the Government Inspector, Mr. Mansergh said they had sufficient water on the gathering-ground, if they could get the power to take it, to increase their supply by 100 million gallons per day. With this before them, the Committee thought it better to increase the inlet-

pipe; so that, at the time there was plenty of water on the fells, they might fill the reservoir, instead of allowing the water to run to waste. The greatest alterations in the estimates, however, had been in regard to the outlet-main from Blea Tarn to St. John's Church. What appeared to be a very large difference in the total estimate was not so really. They obtained a reservoir of 20 millions extra capacity, for which they might allow £10,000. The extra mains would cost £9000; but if they took into account £5000 they originally intended to take from the renewal fund, the difference was £4000. Then there was the item of £7289 for contingencies, which, of course he could not explain, and which might be wanted or not.

Alderman GILCHRIST seconded the motion.

Alderman SMITH doubted whether, if the new estimate had been before the Council in the first instance, the members would have given their consent to the scheme being proceeded with. It was an astounding jump from £35,000 to £61,000, even though the capacity of the reservoir was increased by 20 million gallons. He hoped the cost would not exceed the estimate now under consideration.

Mr. BOWNESS expressed similar views. He considered it was very undesirable that Committees should commit the Council to such great expenditure before taking the members into their confidence.

Mr. HUNTINGTON said he did not know what Mr. Bowness meant by the Committee not taking the members of the Council into their confidence. Alderman Smith moved and the matter was referred back, to give the Committee plenty of time to make inquiries, and that had been done. They had thought it better to ask for plenty of money when going in for borrowing powers; but they were not bound to spend all the money sanctioned.

The minutes were then carried unanimously.

LEICESTER CORPORATION WATER SUPPLY.

In a report which the Water Committee presented at the meeting of the Leicester Town Council last Tuesday week, it was announced that they had arranged with Messrs. John Aird and Sons, the Contractors for the Swithland reservoir, to extend the west end of the main embankment for a distance of about 220 yards, so as to cut off the porous strata in the red marl, at a cost of £5504. It was also stated that negotiations had been entered into by the Committee with the Manchester, Sheffield, and Lincoln Railway Company, with respect to that portion of their railway intended to be carried across the Swithland reservoir, and which it had been arranged should be constructed simultaneously with the reservoir by Messrs. Aird. It had also been agreed that a sum of £1000 should be paid by the Company to the Corporation for the purchase of easement and land, including satisfaction, compensation for damage, &c. With reference to the temporary supplies of water necessitated by the long drought of last year, the total cost amounted to £6618. Alderman Wood, in moving the adoption of the report, made a statement with regard to the present condition of the water supply, remarking that he hoped this would be the last time for some years that the matter would have to be dealt with in this way. The Thornton reservoir was quite full; and the Bradgate reservoir was only an inch below the weir. The total stock of water was about 885 million gallons; showing a deficiency of only 4 million gallons. The deficiency on the corresponding date last year was 643 million gallons. The total amount they had expended on temporary supplies had been £6618; but they had machinery which would realize £1500. During the famine, they tested about 100 different sources of water; and no source was left untouched for miles round the borough. They had been blamed for not taking steps sooner; but had they done so, and laid down a pumping plant in various places, the interest on the capital expenditure would have been very great. The report was adopted; and a resolution was passed, expressing the high appreciation entertained by the Council of the services rendered by the Chairman and Vice-Chairman of the Committee during the recent difficulties.

The Dublin Corporation Improvement Bill.—The statutory meeting of the burgesses of the city of Dublin, to consider the Corporation Improvement Bill which has been promoted in Parliament, was held on Wednesday last. The Lord Mayor presided, and explained the provisions of the Bill. Of the proposals contained in those referring to the gas and water supply, our readers have been fully informed. His Lordship moved a resolution authorizing the application of the funds of the city for the purpose of promoting the Bill. This was seconded by the High Sheriff (Mr. D. Tallon), and, after considerable discussion, was carried. A poll of the burgesses was then demanded, on the ground that the Bill would add to the taxation of the city.

The Tiverton Corporation and the Gas-Works.—On Wednesday last, at a meeting of the Tiverton Town Council, the Electric Light Committee submitted a report recommending the purchase of the gas-works from Messrs. Heathcoat and Co., the present proprietors, for the sum of £20,000. Mr. J. Thorne, Chairman of the Committee, proposed the adoption of the report, and contended that the gas-works should, as a successful monopoly, be in the hands of the Corporation. If the electric light was introduced into Tiverton, it could be worked better with the most formidable rival—the Gas Company—extinguished. An influential section of the inhabitants required the electric light. The average profit of the gas-works in the past three years had been £1786 per annum; and if they bought the works for £20,000, and expended £2000 upon them, they could borrow the money at 3¼ per cent., which would cost the Corporation £1500, and leave a margin of £220 per annum. The scheme would not therefore cost the ratepayers anything. Considerable discussion followed, in which it was stated that it was proposed to supply Messrs. Heathcoat and Co., as large consumers, at a reduced price. Major Gardner favoured the proposal, because he regarded the gas-works as a source of revenue, and trusted that the purchase by the Council would lead them to postpone the electric light question. The report was adopted by 19 votes to 2; and it was decided to apply to the Local Government Board for sanction to borrow £22,000 to carry out the purchase.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I must again record a case of poisoning by gas in Glasgow. This occurred on the south side of the city, in Camden Street, which runs off Caledonian Road, and is but a very short distance from the Tradeston gas-works. It is a poor locality; and, as in all the other cases which have occurred recently in Glasgow, the house was on the ground floor. In this instance, however, there was a difference, in that gas was used in the house. The occupants were an aged man, named Liddell, and his daughter. A fortnight ago a smell of gas was noticed at the place; but after a visit from the Corporation workmen, it disappeared. This morning, about nine o'clock, a workman who lives in a house adjoining that occupied by the Liddells, on leaving for his work, perceived a smell of gas, and traced it to the door of their house. He knocked at the door, but got no response; and then he called in the police, who forced an entrance. A strong smell of gas met them. Having, I suppose, learned by recent experience, the police sergeant threw open the windows, to allow the air to get in. The daughter was found lying, undressed, on the kitchen floor; and her father was in bed in another apartment. Both were unconscious. They were medically treated; and the daughter soon recovered consciousness. The old man was much longer in returning to consciousness; and even now, on account of his great age and weakness, his condition is considered to be very critical. On searching the house for the cause of the escape of gas, the police sergeant found that the two gas-burners in the house were turned full on, and unlighted. Afterwards, on being interrogated, Miss Liddell stated that on Friday night she could not get the gas to light, and was of opinion that the prevailing frost had something to do with the stoppage of the gas supply. During the night she awoke with a choking sensation; and there being a smell of gas, she got up to go to the window, but fell overpowered before she could reach it. The surmise was formed that she must after failing to get the gas to light, have left the cocks open; and that the gas had returned in the course of the night, and found free vent. Later in the day, however, a brother of hers, who lives not far off, stated that nothing had ever been observed wrong with the gas. Between these two statements, there is a conflict. The one is by a woman who had been unconscious, and might not remember exactly what happened; the other is by a man who was not there all night, and does not know what might have taken place before his father and sister retired to bed. Both statements may be correct. The gas may have been burning when the son was in the house, and may have gone out; and the daughter being unable to re-light it, the two may have gone to bed, unaccountably leaving the gas-cocks open. That would do so far; but what would account for a stoppage of the gas supply and its return? The frost is the most likely explanation. During the night, the temperature fell to 3° below zero, which would be quite sufficient to freeze a wet gas-meter; but then what of its re-starting? There are various theories which might be put forward, but they would be all surmises; and as there will be an inquiry into the circumstances of the case, in which the true explanation may be arrived at, it would be useless to pursue the matter further. On the general subject, there is this to be observed, that the two last cases—that of last week and the present—have not been so fatal in their results as the previous ones on the north side of the city. In the present instance, the inmates of the house must have breathed a highly-vitiated atmosphere for a long time; and yet they both were restored to consciousness. In the great disaster of Jan. 12, with a moderate escape, five persons were found to be dead, one died before she could be removed, and another died the day after. If an explanation such as is suggested in your leading article of last Tuesday is given, this is certainly a phase of the subject which might be dealt with.

I find I was mistaken in attributing last week's case to the south side, by associating it with a street of the same name on the south side. The district was the Calton, which is near Bridgeton, on the north side of the River Clyde, and in the eastern central division of the city, not far from the Dalmarnock gas-works.

In Glasgow to-day there was an explosion of gas in connection with the frost, which, though it alarmed one household, did little or no damage. A woman whose gas-meter had been stopped by the frost attempted to thaw it by means of a lighted match, when the explosion occurred, shattering the meter. The incident is a curious one; but it may be easily explained when fuller particulars are known.

In connection with the Glasgow gas coal contracts, mentioned last week, it is intimated that the prices are in some instances 2s. 6d. per ton lower than those paid for coal during the past six months. The Corporation are to expend £13,000 upon the laying of new gas-mains in the eastern districts of the city, including Rutherglen.

A public inquiry was held in Glasgow yesterday—the first of its kind in Scotland under last year's Notice of Accidents Act—into circumstances attending the mysterious explosion which took place in the Dalmarnock Gas-Works on Dec. 13 last.* Mr. A. G. Vernon Harcourt, of Oxford, was the Commissioner appointed by the Board of Trade to conduct the inquiry. Mr. Bowers, Assistant Town Clerk, represented the Corporation of Glasgow. On the occasion of the accident, the men had just started in the morning to remove the spent lime from a purifier, when flame burst out, burning seven of the workmen. The only theory put forward was that a shovel in the hands of one of men must have struck a flint among the lime, causing a spark, which ignited the gas between the layers of lime. Since the accident, it has been customary to remove some of the grids when emptying, to allow the gas to escape. The question of the removal of stones and flints from the lime was raised; but Mr. J. Manwell, the Manager of the Dalmarnock works, thought it would not be worth while—the diminution of risk being so small, and the labour it would entail so considerable. Mr. Harcourt thanked the Corporation for the manner in which the evidence had been given, and said he would report to the Board of Trade. Mr. Bowers complimented the Commissioner upon the care he had taken in the investigation; and intimated that if any

* A report of the proceedings will be found on p. 323.—ED. J.G.L.

suggestion were made by the Board of Trade, the Corporation would give it their most serious consideration, and take whatever steps might be necessary to avert, as far as possible, a recurrence of such an accident, provided the diminished risks that would result from such suggestions were worth the expense and labour which might have to be incurred upon them.

The Corporation of Hamilton, on Thursday of this week, had before them a report by their Manager (Mr. Ewing), which recommended extensions of the gas-works, at a cost estimated by him at £17,440. While all seemed to be agreed that extensions are necessary, some of the members thought they should have before them a report on the same subject which was prepared in 1891 by Mr. A. Gillespie, of Glasgow. In Mr. Gillespie's report, if I recollect aright, the proposal was that extensions should be made which would have cost about £20,000. The Council of that day adopted a modified scheme, which I think was again modified after Mr. Ewing's appointment to the post of Manager, in the summer of 1892; and the alterations carried out cost but a trifling sum. Since then, the maximum output of gas per 24 hours has increased 62 per cent.; and considerable extensions, both of manufacturing and storage plant, are urgently required. The proposal of the Gas Committee was that estimates should be taken before the Corporation decided as to how much work was to be done. This was not a very sensible proposal; and the Town Council, I consider, did right in not adopting it. It was resolved, instead, to get a report by a consulting engineer on the subject; the remit to him to cover also a question raised about the erection of a new gasholder in an outlying district. One member found fault with the Gas Committee for recommending the purchase of splint coal as well as cannel. In his estimation, splint coal is valueless. This is, of course, the opinion of a gentleman who lives in the centre of a very rich coalfield. The reply of Mr. W. Brown, the Convener of the Committee, was that they could not get cannel on moderate terms, and had fallen back on splint against their will. It was agreed to advertise for both varieties of coal.

After the taking over of the Falkirk gas undertaking by the Corporation, a banquet was held on Monday, to celebrate the event. So far as I can learn, there were no representatives of the Gas Company present—certainly none of them took part in the proceedings—and among the numerous toasts proposed, there was not one which had reference to the Company, which surely shows that there is a little rancour in the breasts of the members of the Corporation at the success of the Company in the recent arbitration. The gathering was a sort of family affair, as Provost Griffiths said, "to talk to each other on the subject of that great concern which had passed into the hands of the Corporation." The talk was of the customary joyous banquet order; but underneath it could always be perceived that there was a feeling that too high a price had been fixed. Mr. Storey, who was the head of the movement for procuring the transfer, however, intimated that "he had come to the conclusion that it was a price which they could afford to pay." There can certainly be no exception taken to the Corporation endeavouring now to make the best of their bargain, rather than to cry over spilt milk; but that they have not yet learned the wisdom of the serpent, is shown in speaker after speaker foretelling not only cheaper gas but gas of better quality. They do not seem to know what they are talking about, else they would know that, no matter however good may be the quality of the gas, there always will be some who complain about it; and that therefore it would be better to see if the thing can be accomplished before beginning to hold out expectations that it is to be done. As an instance of the spirit in which the transfer has been regarded, it may be mentioned that the Provost regretted that they could not apply any part of the profits from the gas undertaking to improvements in the town. It is quite evident that the Corporation have a good deal to learn yet. They must not think that they can pay interest upon £90,000, lower the price of gas, improve its quality, and have something to spare all at one time. They had better "learn to creep before they walk."

Some time ago the Hawick Town Council bestirred themselves on the subject of requiring the local Gas Company to grant them concessions by way of rent for permission to lay gas-mains in the public streets. At present, the Gas Company allow 7½ per cent. discount upon the charge for gas consumed in public lamps, and only charge for half the quantity of gas used in lighting the town hall clock. What the Town Council desired was that the Gas Company should give a discount of 15 per cent., light the town hall and St. Mary's clocks free, and make no charge for the meters employed in connection with the public lighting. The reply of the Gas Company was submitted to the Town Council this week. It is a most convincing document. They point out that the present advantages held by the Council amount to nearly £49 a year. Though they do not condescend on a figure, anyone can calculate from their report that, exclusive of the rent of meters, the contribution of the Gas Company would, under the proposal of the Council, amount to more than £94. The Company also point out that in eleven towns in Scotland no charge is made upon the gas companies for the use of streets; that in the following places the charges are: Galashiels, £35 a year; Dunfermline, £20; Kirkcaldy, 25 per cent. on public lamps; Montrose, £15; Ayr, 5 per cent. on public lamps; and that in a number of places the public lighting is by contract, no discount being given. In addition, the Company is a consumers' company; and any charge made by the Council would simply have the effect of raising the price of gas. They therefore could not see it to be their duty to pay any sum by way of rent. To many people, this would look quite conclusive of the matter; but it did not to the Town Council. To them it appeared that they are entitled to the 7½ per cent. discount as large consumers of gas; and that all they get is the half of the lighting of the town clock, amounting to about £8 per annum. They therefore sent the subject back to a Committee to consider further. Well, there are different ways of looking at everything. I should say that when, as private citizens, they get a discount on a large consumption of gas, and another in their capacity as Town Council for the consumption in the public lamps, that is a contribution by the Gas Company to the funds of the Council. The Gas Company merely use the public thoroughfares for the conveyance of their product to the people of the town. I believe that if they open up a street, they will be obliged to re-lay it to the satisfaction of the burgh officials; and that, if it could be calculated, the cost thrown upon the burgh of Hawick in repairing damage done by the Company's workmen is not anything like the outlay on repairs and maintenance which the community have to bear in consequence of the heavy traffic connected with some industries. If rent is to be charged, should it not be the duty of the Council to re-surface the streets after they may be opened by the Gas Company?

The Ceres Gas Company, which last year was re-constituted and their works converted into an oil-gas producing plant on the Alexander-Paterson process, report favourably on the working of the system; there not having been a hitch since starting on Sept. 15 last.

As stated above, this has been a week of exceptionally severe frost. As a consequence, there has been a great deal of inconvenience, in nearly every place, in connection with both gas and water supplies. The latter are suffering most. Something has gone wrong with the water supply to Newport and Tayport, which is derived from the Dundee supply by a pipe laid upon the Tay Bridge; and there is great scarcity of water in both places. Either a burst has occurred, or the pipe has got frozen solid—most probably the latter, as the pipe is a steel one, and therefore made of thinner material than cast-iron ones. If it should be merely frozen up, it will be interesting when the thaw comes to see how the pipe has fared—if the greater elasticity of steel has enabled it to stand the internal pressure without fracture. In connection with the water supply to Edinburgh and Leith, it is intimated that the filter-beds have become frozen and are inoperative, the supply being in consequence given unfiltered; and that, on account of the extraordinary demand which exists at present (many people keeping their water-taps running at night to prevent freezing), the mains which bring the water to the service reservoir at Alnwickhill are unable to carry all that is required. Unless, therefore, a thaw should come within a day or two, there is likely to be a serious scarcity of water.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 9.

Sulphate of Ammonia.—There is a somewhat weaker feeling, which, however, is only to be expected, seeing that the prevailing exceptional condition of the weather is conducive to the postponement of usual requirements. So long as there are needy sellers at junctures such as the present, prices must receive an impact; and any improvement will only come with altered conditions. The export returns for last month are very satisfactory, showing an excess as compared with last year; the most noticeable feature being a large increase to Spain and America, while Germany has drawn less supplies than usual. The quotations are more or less nominal at £11 2s. 6d. to £11 5s.; the latter being the value at Leith. There is an easier tone in nitrate, which lies under the same disadvantage as regards frost or snow; and a late season is always detrimental to the course of values. Price on spot, 8s. 6d. to 8s. 7½d. per cwt.

LONDON, *Feb.* 9.

Tar Products.—Benzols continue steady at the low price to which they have fallen; and purchasers are undoubtedly desirous of buying as far forward as is possible at these rates, which is a healthy sign for the future of this market, especially having regard to the enormous production of benzols from coke-ovens. Undoubtedly large quantities are being used, especially on the Continent, for increasing the illuminating power of gas. One important gas concern in Germany, by taking more gas from the coal and enriching with benzol, claims to have largely reduced the cost of production per 1000 cubic feet. Creosote and common tar oils are in poor request, at decreasing values. Pitch is fairly firm; but there is much hesitation on the part of buyers as to whether the present prices can be maintained. The undoubted decreased production during the past season may prevent any serious fall in it. Anthracene is steady; and carbolic acid is held firmly at the advanced prices. A large trade is now being done in creosote salts, and better forms of naphthalene; and it is not unlikely that this much-abused product may yet become an important item to the tar distiller. Quotations during the week are as follows: Tar, 17s. 6d. to 21s. 6d. Pitch, 34s. to 35s. prompt; 32s. forward. Benzols, 50's and 90's, 1s. Solvent naphtha, 1s. 2½d. Toluol, 1s. 3d. Crude, 30 per cent., naphtha, 4⅜d. Creosote, liquid, 2d.; ordinary, 1⅜d.; salts, 18s.; pressed, 40s. Cresylic acid, nominal, 1s. Carbolic acid, 60's, 1s. 9d. Anthracene, "A," 1s. 1d.; "B," 10½d.

Sulphate of Ammonia is not quite so strong, arising chiefly from the closing of several Continental ports by the inclement weather. There is good inquiry for early spring delivery at £11 5s. to £11 10s., while sales during the week have only realized £11 to £11 5s., according to port of delivery in all cases, less 3½ per cent. discount. Gas liquor is quoted at 7s. 6d. to 9s. 6d.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—If anything, there is perhaps more activity in the round coal trade, owing, of course, to the increasing requirements for house-fire consumption; and the collieries raising the better qualities are, with few exceptions, running upon practically full time (five days per week), although it is only in isolated instances where any weight of stock is being filled up. The lower qualities of round coals, however, meet with no better demand for iron-making, steam, and general manufacturing purposes; and they are generally a drug, with common round coal pits not running more than about four days per week. Engine classes of fuel are moving off fairly well; and although collieries here and there hold stocks which they would clear at low figures, prices generally are steady at late rates. Prices generally for house-fire coals are firm at recent quotations. But best Wigan Arley does not average more than 10s. 6d. to 11s. per ton; Pemberton four-feet and seconds Arley, 9s. up to 10s.; and common house-coals, from 7s. 6d. to 8s. Steam and forge coals are offering at extremely low figures, and can be bought at the pit mouth readily at

6s. to 6s. 6d. per ton; whilst for shipping there are sellers at 7s. 9d. to 8s. per ton delivered at the Garston Docks or the High Level, Liverpool, with better qualities fetching about 8s. 3d. to 8s. 6d. Good qualities of slack are still realizing 4s. 6d. to 5s. per ton at the pit mouth; with common sorts at about 3s. 6d. to 4s.

Northern Coal Trade.—The condition of the coal trade of this district has been exceptionally dull of late, and that in most of its branches. The stormy weather has delayed the arrivals of steamers, and reduced the consumption of fuel in shipbuilding and other industries; and though it has increased the consumption both of gas and household coal, there has been a rate of production that has been more than adequate to meet all requirements. Best Northumbrian steam coals have been exceptionally depressed; and as many of the pits have been working very short time, low prices have ruled in the attempts to secure more trade. Generally, the prices that have been quoted have been from 8s. 9d. to 9s. per ton f.o.b.; but it is believed that there have been some sales below these figures. Steam small coals have been less plentiful; and the price has been comparatively steadier, at from 3s. to 3s. 6d. per ton. There is very little alteration in the price of manufacturing coal; but the working of the chemical factories, and of the South Durham Salt-Works, has increased the consumption. Gas coal has still a very large delivery, though it is now unequally distributed over the producing collieries, so that the work is irregular. Prices are still maintained at from 7s. 3d. to 7s. 9d. per ton f.o.b.; but it seems to be doubted how far these rates will rule in some contracts that are being negotiated. The coke trade is dull; shipments being much restricted. Prices vary from 13s. to 13s. 6d. per ton f.o.b. for best Durham coke. As to gas coke, there is still a large demand for shipment; and the prices are well maintained, though the production continues above the average at this time of the year.

Scotch Coal Trade.—The present severe weather is hampering the trade in Scotland considerably. There is a good demand for coal for domestic use; and the finer qualities of ell are better inquired after. But otherwise the market, from the coalmaster's point of view, is far from active. Shipping is much retarded by the weather; and, in addition, the prices offered are so low that coalowners are not anxious to enter into contracts. There is, in consequence, much irregularity in requirements from the pits. There is a feeling in some quarters that the bottom has been reached, and that prices will now improve. Splint coal is abundant—more abundant than the demand for it; and prices are consequently tending to droop. There is also a plentiful supply of steam coal; but the demand for it is limited. The quotations are: Main, 6s. 3d.; ell, 7s.; splint, 6s. 9d. to 7s.; and steam, 7s. 9d. to 8s. 3d. per ton f.o.b Glasgow. The shipments for the week amounted to 102,150 tons—an increase on the previous week of 18,145 tons; but a decrease, compared with the corresponding week of last year, of 23,971 tons. For the year to date, the total shipments have amounted to 460,547 tons—a decrease, compared with the corresponding period of last year, of 193,592 tons.

Bristol Water Company.—An extraordinary meeting of this Company was held last Saturday week for the purposes of considering and approving of the Bill that the Directors have deposited in Parliament, and of authorizing the issue of additional stock. The Chairman (Mr. E. Bush), in moving the adoption of the draft Bill, said, as the shareholders were aware, they had had to go deeper for foundations for the works they were constructing in the Yeo Valley than they originally anticipated. Of course, this meant taking a longer course, and, as their time expired in eighteen months, they thought it advisable not to delay the matter too long, but to go to Parliament this year, and ask for an extension of time. There was nothing against it; but, having to go lower for the foundations, it would cost a great deal more money. Nevertheless, their Engineers, who were eminent men, thought that, when the works were completed, they would stand among the cheapest in the kingdom. The motion was unanimously carried; and then a resolution was passed giving the Directors power to issue the £100,000 of 7 per cent. maximum stock created in 1889. This stock is to be consolidated with that created in 1888.

Stockton Gas Stokers and the Eight-Hour Day.—At the meeting of the Stockton Corporation last Tuesday, Mr. Vickerson moved—"That the hours of labour of the workmen employed at the gas-works be reduced to eight per day." The Town Clerk (Mr. Dodds) read a letter from the Trades and Labour Council asking the Corporation to adopt the fair wage clause so far as related to the men employed at the gas-works. Mr. Vickerson pointed out that Stockton was almost by itself in employing its gas men for twelve hours. Mr. J. Smith seconded the motion. Mr. Darbyshire asked if Mr. Vickerson had received any instructions from the men to bring forward the question. Mr. Nightscales asked if the Manager had received from the men any application for a reduction of hours. Mr. Ford, in reply, stated that he had not. Some eighteen years ago the Gas Committee asked him to invite the men to institute the eight-hour movement; and he was at the time very much inclined to recommend the Committee to adopt it. But the men did not want it. He had prepared a statement of the time worked. The men were on the works 10 hours 50 minutes per day. The total time worked was 4 hours 25 minutes, the time allowed for rest and recreation was 4 hours 25 minutes, and 2 hours were for meals. Mr. Mawlam asked what would be the extra cost. Mr. Ford was unable to say at once, as it would all depend on the conditions. If they compelled the men to do the same amount of work, 90 per cent. of them could not do it. Alderman Hind complained that Mr. Vickerson had gone behind the workmen, and claimed for them a change which they did not want. His motive was good, for he wished to employ one-third more men. But it might turn out differently if the men had to do the same amount of work; and his argument was that the men would not benefit by it, while the agitation might lead to an increase in mechanical firing. The more they had to pay for labour, the more they would be compelled to look out for cheaper substitutes for it. The change would cost £1500; and this would mean either an increase of 3d. per 1000 cubic feet in the price of gas, or 3d. in the pound in the rates. Mr. Cameron moved that the matter be referred to the Gas Committee for consideration; and this was agreed to.

Reductions in Price.—The Willenhall Gas Company will reduce the price of gas by 3d. per 1000 cubic feet from April 1 next.——The price of gas at Chippenham has been reduced from 4s. 2d. to 3s. 9d.—the concession to date from the 1st ult.——The Dawlish Gas Company have reduced the price of gas by 3d. per 1000 cubic feet—making it 3s. 9d. to large and 4s. to small consumers.

Dorchester Gas Fitting Company, Limited.—At the annual general meeting of this Company, held to-day, the Directors will present a statement of accounts showing a profit of £76 on the year's working; the amount available for division being £124. They recommend a dividend of 9d. a share (about 11 per cent.); leaving £60 unappropriated. The called-up capital of the Company is £595.

Gas-Works Extensions at Market Harborough.—At a recent meeting of the Directors of the Market Harborough Gas Company, the question of enlarging the gas-works was under consideration; it being thought expedient, in view of the recent development of the town. Extensive alterations were decided upon; and these are to be carried out under the superintendence of the Manager (Mr. J. Fryer).

The Rotherham Corporation and Messrs. Guest and Chrimes.—We learn that the Gas-Works Sub-Committee of the Rotherham Corporation have recommended that the tender of Messrs. Guest and Chrimes for castings, gas-fittings, and gas-meters should be accepted. It will be remembered that a good deal of discussion arose a short time ago relative to this firm, on account of their having declined to comply with the terms of the "contracts resolution."

The Liverpool Corporation and the Gas Company.—Our readers will remember that some short time since a difficulty arose between the Liverpool Corporation and the Gas Company as to the price to be paid for the public lighting. The matter was submitted to arbitration, before Sir J. Warner. We learn from the *Liverpool Courier* that the matter has been settled by the Corporation agreeing to pay the Company's accounts up to the period included in them, as well as the costs of the arbitration proceedings. The future arrangements are to be the subject of amicable settlement.

South Wingfield Water Supply.—A Local Government Board inquiry was held a short time ago, by Mr. G. W. Willcocks, to consider an application for sanction to a loan of £4700 for water supply purposes. It is proposed to take water from two brooks, two springs, and a borehole for the supply of the village, which contains about 1300 inhabitants. There will be filter-beds and a small service reservoir, and the water will be delivered by gravitation. Dr. Barwise, the Medical Officer of Health for the district, said he thought two of the sources of supply might be polluted by surface contamination; and a supply from the Oakerthorpe Spring was suggested. The Inspector visited the site of the proposed works.

The Hanley Town Council and the British Gaslight Company.—The Hanley Town Council met last Thursday week to consider a resolution authorizing opposition to the Bill which the British Gaslight Company have deposited in Parliament, for empowering them to expend further capital on their Potteries works. The Mayor (Alderman E. J. Hammersley) moved the resolution; and it was seconded by Mr. Huntbach, who said there was no doubt the Company were making very large dividends. He was of opinion that the light of every town should belong to the local authority; and he hoped this would be the case in Hanley some day. Mr. Beechener asked if anything could be done in the matter of the municipalization of the undertaking. The Mayor replied that the only object of the present resolution was to protect their rights as a borough. After a brief discussion, the resolution was carried unanimously.

New Joint-Stock Companies.—The Austrian Incandescent Share Company, Limited, has been formed with a capital of £320,000, in £1 shares, to acquire 775 shares in the Austrian Company known as the Oesterreichische Gasglühlich Actiengesellschaft, and to carry into effect the agreements referred to in clause 3 of the Company's Articles of Association—(1) with F. de la F. Williams, J. Moeller, G. de la Poer Beresford, C. Jones, A. J. Bethell, W. Ellis, C. H. Feeleng, W. Morgan, L. de Fonblanque, and the Incandescent Gas-Light Company, Limited; and (2) with F. C. Stoop and Co. The Managers are to be the Incandescent Gas-Light Company, Limited; the remuneration to be £500 per annum. The Directors of the above Company are to be Deputy-Managers of this Company. The Prepayment Gas-Meter Company, Limited, has been registered with a capital of £75,000, in £1 shares, to adopt an agreement made between R. W. Brownhill of the one part and T. G. Harvey, on behalf of the Company, of the other part, and to carry on business as manufacturers of gas-meters, prepayment attachments, mechanical and gas engineers, coal merchants, coke makers, suppliers of gas, and dealers in the residual products thereof. The first Directors are G. B. Cliff, Major W. F. Gordon, R. Curphey, J. R. L. Daish, Sir M. Wood, and R. W. Brownhill.

Gas-Works Extensions at Workington.—The members of the Workington Town Council had before them last Tuesday a report by the Gas Manager (Mr. Johnston) upon the gas-works. He stated that the present storage for gas was very limited; being much below one day's consumption. Last year the heaviest daily consumption was 268,700 cubic feet; and the holder capacity was only 202,000 cubic feet—leaving a deficiency of 66,700 feet. He strongly advised the erection of another holder of the same capacity as the present one, which would give them additional storage for 189,300 cubic feet, and effect a considerable saving in labour and fuel. The cost of the holder and tank would be about £4300. He further recommended the erection of plant for the manufacture of sulphate of ammonia, the cost of which to produce 5 tons weekly being estimated at £420, and that Hislop's patent regenerative system of retort-setting should be adopted, at an estimated cost of £2518. The Gas Committee recommended that the question of the erection of a new holder stand over for the present; that the Manager prepare plans and specifications for the sulphate of ammonia works; and that statistics be obtained respecting the cost of, and the saving which would result from, the adoption of the regenerative settings. The Committee's recommendations were adopted.

Midhurst Water Supply.—An artesian tube-well, 176 feet deep, has recently been bored for the Midhurst Rural District Council by Messrs. Le Grand and Sutcliff, of London; and it has been attended with very successful results. The site is on high ground a short distance to the north of the town, where, at an elevation of fully 50 feet above the highest house, a strong spring has been struck in the Hythe beds. It rises to 17 feet above the surface, and flows at the rate of 130,000 gallons per diem. The water proves to be soft, and of excellent quality.

The Public Lighting of Maidstone.—Mr. H. Smythe, the Engineer and Manager of the Maidstone Gas Company, has addressed a letter to the Clerk of the District Council with respect to their application for a reduction in the price charged for gas supplied for public purposes (see *ante*, p. 233). He says that his Board regret that they are unable to comply with the request. In making this decision, the Directors had to consider that, although the Council are nominally paying the same rate as other consumers for gas, they are, on account of each lamp consuming 2000 feet per year more than is charged for, actually paying 2s. 1d., or 3d. per 1000 feet less than ordinary consumers. He adds that the Directors are now paying for all lamp-posts and for various extensions of mains and services which they did not formerly pay; and they have taken every opportunity of lowering the price of gas. He enclosed the prices paid for public lamps by neighbouring towns, in comparison with which the charge is much less at Maidstone.

Opposition to the London Water Bills.—At a meeting of the Bromley District Council last Friday, Mr. Bosanquet (the Chairman) said he represented the Council, with Mr. G. H. Payne, at a conference, when delegates from all parts of Kent met, under the chairmanship of Sir John Farnaby Lennard, for the purpose of discussing the London County Council's Water Bills. The conference resolved that as much of the Bills as affected Kent should be fought as strongly as possible; the costs occasioned by such opposition to be borne rateably by the several local authorities joining therein. There was a very strong and predominating feeling that the County Council were anxious to obtain control of the water supply in West Kent for the purpose of delaying the time when they would have to go a long distance for water, as Liverpool and other large towns had had to do. A suggestion had been made that Bromley and Beckenham should combine to form a water district of their own, and thus secure the water which was at their very feet; and it was resolved to consider this question.

The Price of Gas at Dukinfield.—Among the minutes submitted by the Gas Committee at last week's meeting of the Dukinfield District Council was one recording a resolution to reduce the price of gas by 3d. per 1000 cubic feet; and it gave rise to a little discussion. The adoption of the minutes was proposed by the Chairman of the Committee (Mr. Halstead), who said he had no doubt the public would be glad to learn that the price of gas had been reduced to its original figure, according to a resolution passed twelve months ago. Their object was not to make anything out of the works; they were merely anxious that they should pay their way, and that the consumers should have gas as cheap as it was possible to make it. For many years Dukinfield had done what other towns were now contemplating—viz., the provision of meters free of charge. Mr. Wood, referring to the consumption of oil in the district, pointed out that the smaller the quantity of gas made, the more expensive it was to produce it; and if people would continue to use oil, it would become a serious matter for the Committee, Council, and the ratepayers generally. Mr. Bancroft hoped that the public would appreciate the reduction, and that it would be the means of more gas being consumed, and a better quality produced. There had been a great many complaints regarding the gas; and these had resulted in people beginning to burn oil. Mr. Pratt thought the price would compare very favourably with that charged in other districts. The minutes were passed.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 306.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.				£ s. d.
590,000	10	11 Oct.	10½	Alliance & Dublin 10 p. c.	10	21 - 22	+1	4 15 6
100,000	10	,,	7½	Do. 7 p. c.	10	14—15	+½	5 0 0
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	105—107	+1	4 13 4
200,000	5	14 Nov.	6½	Bombay, Limited	5	6¼—6¾	..	4 16 5
40,000	5	,,	6½	Do. New	4	4½—5	..	5 4 0
380,000	Stck.	15 Aug.	11½	Brentford Consolidated	100	237—242	+2	4 15 0
180,000	,,	,,	8½	Do. New	100	187—192	..	4 8 6
220,000	Stck.	28 Sept.	11	Brighton & Hove Original	100	220—225	..	4 17 9
888,500	Stck.	30 Aug.	5	Bristol	100	115—120	..	4 3 4
320,000	20	28 Sept.	11½	British	20	49½—50½	+½	4 9 1
50,000	10	30 Aug.	11½	Bromley, Ordinary 10 p. c.	10	21½—22½	..	5 2 2
51,510	10	,,	8½	Do. 7 p. c.	10	16½—17½	..	4 17 2
328,750	10	14 Nov.	2	Buenos Ayres (New) Limited	10	6—6¾	..	3 1 6
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	100—103	..	5 16 7
150,000	20	12 July	8	Cagliari, Limited	20	27—28	..	5 14 3
550,000	Stck.	11 Oct.	13	Commercial, Old Stock	100	277—282	..	4 12 2
165,000	,,	,,	10	Do. New do.	100	203—208	..	4 16 2
160,762	,,	13 Dec.	4½	Do. 4½ p. c. Deb. do.	100	130—135	..	3 6 8
800,000	Stck.	13 Dec.	13	Continental Union, Limited.	100	240—245	..	5 6 1
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	205—210	..	4 15 3
535,000	Stck.	30 Aug.	5	Crystal Palace Ord. 5 p. c. Stk	100	117—122	..	4 1 11
486,090	10	31 Jan.	11	European, Limited	10	24—25*	+1	4 8 0
354,060	10	,,	11	Do. Partly paid	7½	16—17*	..	4 17 1
5,646,590	Stck.	15 Aug.	12	Gaslight & Coke, A, Ordinary	100	268—273	+1	4 8 0
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	105—110	..	3 12 9
665,000	,,	,,	10	Do. C, D, & E, 10 p.c.Pf.	100	280—285	..	3 10 2
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130—135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	200—205	..	3 13 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	185—190	..	3 13 8
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	277—282	..	3 10 10
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	165—170	..	3 10 7
1,061,150	,,	13 Dec.	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	140—145	+5	3 2 1
908,000	,,	,,	6	Do. 6 p. c. do.	100	188—192	..	3 2 6
3,800,000	Stck.	14 Nov.	12	Imperial Continental	100	238—243	..	4 18 9
75,000	5	13 Dec.	6	Malta & Mediterranean, Ltd.	5	5⅜—6¾	+¼	4 16 0
560,000	100	1 Oct.	5	Met.of Melbourne, 5 p.c. Deb.	100	111—113	+1	4 8 6
541,920	20	14 Nov.	5	Monte Video, Limited	20	15⅜—16½	..	6 1 2
150,000	5	29 Nov.	8	Oriental, Limited	5	7—7⅝	..	5 6 8
60,000	5	13 Sept.	7	Ottoman, Limited	5	4¼—4⅝	..	7 7 4
166,870	10	31 Jan.	2	Para, Limited	10	1⅝—2⅛	..	8 0 0
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	105—109	..	5 10 1
500,000	100	1 Dec.	6	2nd Do.	100	102—107	+2	5 12 1
150,000	10	11 Oct.	6	San Paulo, Limited	10	8¾—9⅛	..	6 6 4
500,000	Stck.	30 Aug.	15½	South Metropolitan, A Stock	100	340—350	..	4 8 7
1,350,000	,,	,,	12	Do. B do.	100	295—300	..	4 0 0
290,000	,,	,,	13	Do. C do.	100	310—315	+2½	4 2 6
775,000	,,	16 Jan.	5	Do. 5 p. c. Deb. Stk.	100	167—172	..	2 18 2
60,000	Stck.	30 Aug.	11½	Tottenham & Edm'nton, "A"	100	225—230	..	5 0 0
				WATER COMPANIES.				
746,021	Stck.	28 Dec.	10½	Chelsea, Ordinary	100	290—295	..	3 8 8
1,719,514	Stck.	11 Oct.	8	East London, Ordinary	100	235—240	..	3 6 8
654,740	,,	28 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	150—155	..	2 18 0
700,000	50	13 Dec.	8½	Grand Junction	50	122—124	..	3 8 7
708,000	Stck.	15 Aug.	12	Kent	100	307—312	..	3 16 11
1,043,800	100	28 Dec.	9½	Lambeth, 10 p. c. max.	100	270—275	..	3 9 1
406,200	100	,,	7½	Do. 7½ p. c. max.	100	207—212	..	3 11 1
330,000	Stck.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	135—138	..	2 17 11
500,000	100	15 Aug.	12½	New River, New Shares	100	393—398	..	3 0 11
1,000,000	Stck.	31 Jan.	4	Do. 4 p.c. Deb. Stk.	100	140-145*	..	2 15 2
902,300	Stck.	13 Dec.	6	S'thwk & V'xhall, 10 p.c. max.	100	170—174	..	3 9 0
126,500	100	,,	6	Do. D 7½ p.c. do.	100	160—165	..	3 12 9
1,155,066	Stck.	13 Dec.	10	West Middlesex	100	280—285	..	3 10 2

*Ex div.

GWYNNE & BEALE'S
PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

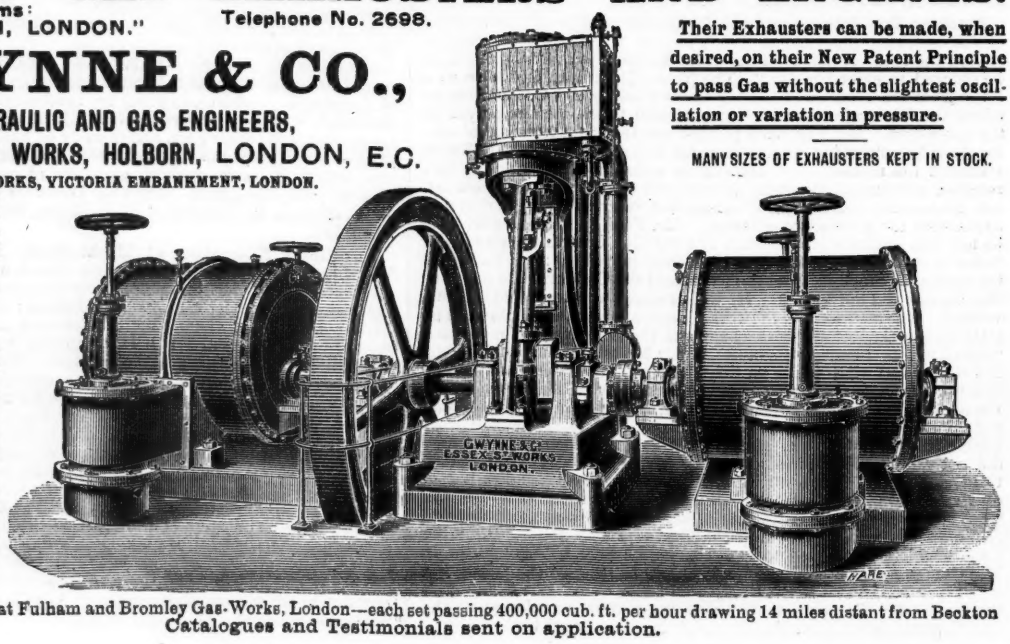
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM, PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
JOHN WM. O'NEILL, Managing Director,
Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works.
ANDREW STEPHENSON,
182, GRESHAM HOUSE,
OLD BROAD STREET,
LONDON, E.C.
Telegrams: "Volcanism, London."

AMMONIACAL LIQUOR Wanted.
BROTHERTON AND Co., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted.
BROTHERTON AND Co., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted.
BROTHERTON AND Co., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See last week, p. 288.)
Telegrams: "HUTCHINSON BROS., BARNSLEY."

GOLD MEDAL, 1892.

TUBES and Fittings for Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

CHARTERING, FORWARDING, AND INSURANCE.

ROBERT BRUCE FITZMAURICE, 29, Great St. Helens, London, Shipping Agent to several Gas Companies and Plant Manufacturers, would be glad to UNDERTAKE LARGE or SMALL SHIPMENTS to any Port.

HAMBURG (GERMANY),
ED. ZIETZ, I. BRANDSTWIETE, 20,
COMMISSION BUSINESS,

AGENT for the Deutsche Gasglühlicht Akt. Ges. Berlin, offers his services FOR THE SALE OF LIGHTING AND HEATING APPARATUS of every description; also of any Patent Novelties.
Business connections with all Countries.
Correspondence in all modern Languages.

WANTED, a Stoker (used to Exhauster), for a Gas-Works 20 miles South of London. Total Abstainer preferred. Wages, 33s. per week.
Apply, by letter, to No. 2480, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Persons with connection to CALL ON GAS COMPANIES for the Sale of Article in daily use.
State, by letter, Locality and Remuneration expected to No. 2477, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, at once, by a Country Gas Company, a BOOK-KEEPER, with a knowledge of Gas-Fitting Business. To live on premises.
Apply, by letter, stating Age and Salary required, to No. 2478, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MANAGER and Secretary required by a Gas Company (about 30 miles from London), making 23 Million Cubic Feet of Gas per annum. House on Works.
Apply, stating Qualifications and Salary required, to No. 2479, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Manager for the Wakefield Gaslight Company. Make about 250 Million Cubic Feet per annum.
Applications, stating Age, and enclosing not more than three recent Testimonials, to be sent not later than Friday, the 1st of March next, endorsed "Manager," and addressed to the SECRETARY, Gas Office, WAKEFIELD.

W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. II., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

WANTED, a thoroughly competent and experienced TRAVELLER for the Midland Gas and Steam Coal Trade. One having a good connection would be liberally dealt with.
Address No. 2476, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

AN old-established and well-known Manufacturing Firm are prepared to treat with a Gentleman competent to undertake the GENERAL SUPERVISION of the GAS-WORKS DEPARTMENT of their Business, in which Gas-Meters, Governors, Exhausters, Valves, and Testing Apparatus are manufactured.
Applicants must have ability in the matter of Design, Illustration, Construction, and Specification of such Apparatus, and in initiating improved methods of production, and be capable of probably Managing this branch of Gas Engineering.
Correspondents may rely on the strictest confidence being observed.
Address, giving full Particulars of Experience and Qualifications, with views as to Remuneration, to ARGUS, Box 415, care of Sell's Advertising Offices, LONDON.

BOROUGH OF ILKESTON.

ALTERATIONS AND ADDITIONS TO GAS-HOLDERS.

TENDERS are invited for Telescoping a 52-feet GASHOLDER and supplying a NEW ONE.
Forms of Tender, Drawings, and Specification can be had on application to Mr. F. C. Humphrys, Engineer, Gas-Works, Ilkeston, on payment of One Guinea, returnable on receipt of a *bond-fide* tender.
Sealed endorsed tenders to be delivered to the undersigned by the 6th of March next.
The Corporation do not bind themselves to accept the lowest or any tender.
The usual security for the due execution of the contract will be required.
WRIGHT LISSETT,
Town Clerk.
Town Hall, Ilkeston,
Feb. 9, 1895.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality.
Sample and Price on application.
OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore.
Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

In Paper Covers, Post Free, Price 2s.

S. CARPENTER on the Purification of COAL GAS from CARBONIC ACID and the SULPHUR COMPOUNDS by LIME, OXIDE OF IRON, and ATMOSPHERIC AIR.
S. & H. W. CARPENTER, 3, Bedford Villas, Carshalton, SURREY.

DERBY GAS COMPANY.

GAS EXHIBITION AND COOKERY LECTURES.
DRILL HALL, DERBY, MARCH 27 TO APRIL 6, 1895.

APPLICATIONS for Space invited for all kinds of Gas Apparatus, Lighting Appliances, Gas-Engines, &c. Gas and Service Pipe supplied free up to Stand side. Gas-Stove Makers admitted for sale only exhibiting through local tradesmen.
For terms of Space and all Details, apply to R. FISHER, Esq., Gas Offices, DERBY.
Applications must be received on or before Feb. 27.

FOR SALE—A Cylindrical Station METER; capacity 5000 cubic feet per hour.
Address MALTON GAS COMPANY, Malton, YORKS.

FOR SALE—Handel's Patent Improved GAS-COCK; No. 15,063, Aug. 7, 1894. See JOURNAL OF GAS LIGHTING, Dec. 11, 1894.
Address T. HANDEL, Gas-Works, ILMINSTER.

SHEFFIELD UNITED GASLIGHT COMPANY.
NEEPSEND STATION.

TO ELEVATOR MANUFACTURERS, ENGINEERS, ETC.

THE Directors of this Company invite TENDERS for the Manufacture, Delivery, and Erection of Four OXIDE ELEVATORS and One LIME ELEVATOR and CONVEYOR for their No. 3 Purifying-House.
Copy of the Drawing, with Specification, may be obtained upon application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of *bond-fide* tender.
Sealed tenders, endorsed "Tender for Elevators," to be delivered (by post) to the undersigned at the Company's Offices, on or before Saturday, the 2nd day of March next.
The Directors do not bind themselves to accept the lowest or any tender.
HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
Feb. 6, 1895.

SHEFFIELD UNITED GASLIGHT COMPANY.
NEEPSEND STATION.

TO IRONFOUNDERS, ETC.

THE Directors of this Company invite TENDERS for the manufacture and delivery (without erection) of RETORT-FITTINGS for 96 Retorts; also PLATES and GIRDERS for STAGE FLOOR for their No. 2 Retort-House.
Drawings may be seen and Bill of Quantities, with Specification and Form of Tender, obtained on application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of *bond-fide* tender.
Sealed tenders, endorsed "Tender for Retort-Fittings," to be delivered (by post) to the undersigned, at the Company's Offices, on or before the 2nd day of March next.
The Directors do not bind themselves to accept the lowest or any tender.
HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
Feb. 9, 1895.

FIRE-CLAY RETORTS, ETC.

THE Urban District Council of Buxton invite TENDERS for the supply of RETORTS, QUARRIES, BRICKS, CLAY, &c., for a period of Twelve Months.

Forms of Tender and Particulars may be obtained of Mr. Smedley, Gas Office, Town Hall, Buxton.

Tenders, endorsed "Tender for Retorts, &c.," to be addressed to the Chairman of the Gas Committee, not later than the 30th inst.

By order,
JOSIAH TAYLOR, Clerk.

Town Hall, Buxton,
Feb. 7, 1895.

GASHOLDER AND TANK.

THE Directors of the Pickering Gas and Water Company invite TENDERS for the construction of a GASHOLDER, 45 feet diameter by 16 feet deep, and STEEL TANK to contain same.

Specifications and Drawings may be seen, and particulars obtained, on application to the Engineer, Mr. Henry Tobey, Gas Office, Malton.

Tenders, marked "Tender for Gasholder," to be addressed to the Chairman, Gas and Water Company, Pickering, Yorks., and to be sent in not later than the 21st day of February, 1895.

The Directors do not bind themselves to accept the lowest or any tender.

HENRY M. DAWSON,
Secretary.

BOROUGH OF DARLINGTON.
(GAS-WORKS DEPARTMENT.)

THE Gas-Works Committee invite TENDERS for the IRONWORK in connection with supplying and fixing two PURIFIERS at the Darlington Gas-Works.

Plans and Specifications of the work required may be seen, and Form of Tender obtained, on application to Mr. Thomas Smith, Gas-Works Engineer, Town Hall, Darlington.

Tenders, which must be on the form provided, endorsed "Tender for Purifiers," to be sent to me not later than the 21st inst.

No pledge is given that the lowest or any tender will be accepted.

By order,
F. T. STEAVENSON,
Town Clerk.

Darlington, Feb. 9, 1895.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT,)

TENDERS FOR SULPHURIC ACID.

THE Gas Committee invite Tenders for the supply of about 1200 tons of SULPHURIC ACID.

Forms of Tender may be had on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed tenders, endorsed "Tender for Acid," addressed to the Chairman of the Gas Committee, to be delivered at my Office, Town Hall, Salford, not later than Three p.m., on Thursday, Feb. 21.

By order,
SAMUEL BROWN,
Town Clerk.

Town Hall, Salford,
Feb. 8, 1895.

COUNTY BOROUGH OF SALFORD.
(GAS DAPARTMENT.)

THE Gas Committee invite Tenders for the purchase and removal of the surplus TAR to be produced at their Bloom Street, Regent Road, and Liverpool Street Works in Nine Months from July 18 next. The approximate quantity will be 6000 tons.

Further particulars may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed tenders, endorsed "Tender for Tar," addressed to the Chairman of the Gas Committee, must be delivered to me not later than Three p.m. on Thursday, the 21st inst.

By order,
SAMUEL BROWN,
Town Clerk.

Town Hall, Salford,
Feb. 8, 1895.

MANUFACTURE AND SUPPLY OF GAS AT NETLEY.

THE Secretary of State for War is pre- pared to receive TENDERS for the Manufacture and Supply of GAS at the Royal Victoria Hospital, Netley, during the period of Six Years, from the 1st of April, 1895.

The existing Gas-Works may be inspected, on application to the Officer Commanding the Troops at that Station; and Printed Forms of Tender, and any further Information obtained, on application to the General Officer Commanding the Troops, District Head Quarter Offices, Portsmouth.

The tenders are to be delivered at the District Head Quarter Office, Portsmouth, by Twelve o'clock noon, on Wednesday, the 27th day of February, 1895, addressed to the General Officer Commanding, and marked on the outside "Tender for Gas at Netley."

District Head Quarter Office,
High Street, Portsmouth,
February, 1895.

SOUTH ESSEX WATER-WORKS COMPANY.

NOTICE is Hereby Given, that an ORDINARY GENERAL MEETING will be held at the Guildhall Tavern, 81, Gresham Street, E.C., London, on Saturday, the 23rd day of February, 1895, at Twelve o'clock noon, to consider the Directors' Report and to pass Resolutions thereon, and the declaration of Dividends.

The Transfer Books are closed until after the Meeting.

C. J. FOX,
Secretary.

Offices: Romford,
Feb. 5, 1895.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Ossett Gas Com- pany are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR and surplus TAR produced at their Works during the next Twelve Months.

The Liquor can be loaded into Tank-Waggons at the Lancashire and Yorkshire Railway Siding, Healey, Ossett.

Liquor to be quoted for, both by Twaddel's and Wills's Tests.

Tenders to be sent in not later than Wednesday, the 20th of February, 1895.

By order,
JAS. CASTLE,
Secretary.

Ossett, Feb. 7, 1895.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the Directors of the above Company intend to offer FOR SALE by Public Auction at the Mart, Tokenhouse Yard, in the City of London, on Tuesday, the 12th day of March next, at Two o'clock in the afternoon precisely, £20,000 (being the third portion) of "C" STOCK, in the following lots: 150 of £100 each, and 100 of £50 each, issued under the powers of the Tottenham and Edmonton Gas Act, 1882.

By order,
JAMES RANDALL,
Secretary.

Dated this 1st day of February, 1895.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors in this Company will be held at the Company's Offices, Willoughby Lane, Tottenham, on Saturday, the 23rd day of February inst., at Half-past Three o'clock in the Afternoon precisely, to receive the Report of the Directors, the Statement of Accounts for the Half Year ended the 31st day of December, 1894, to declare Dividend, and to transact such other Business as the Act of Parliament directs.

The Transfer Books will be closed from Saturday, the 9th, until Monday, the 25th inst., both days inclusive.

By order of the Board,
JAMES RANDALL,
Secretary.

Offices of the Company,
Willoughby Lane, Tottenham,
Feb. 8, 1895.

RIDDINGS DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Shareholders of the above Company will be held at the Offices of the Company, No. 30, Gracechurch Street, in the City of London, on Thursday, the 28th day of February, 1895, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ending the 31st day of December last, to declare a Dividend, to elect Directors and an Auditor in the place of those retiring by rotation, and to transact the General Business of the Company.

The Transfer Books will be closed from the 15th to the 28th inst., both inclusive.

By order of the Board,
ALFRED LASS,
Secretary.

Offices: 30, Gracechurch Street,
London, Feb. 8, 1895.

BRIGHTON & HOVE GENERAL GAS COMPANY.

NOTICE OF GENERAL MEETING.
TO THE PROPRIETORS.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 5, Great Winchester Street, London, on Friday, the 1st of March, 1895, at Two o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 31st of December, 1894, to declare Dividends, to elect Directors, to appoint a Special Auditor, and for other purposes.

The Transfer Books of the Company will be closed from the 16th of February to the 1st of March, both days inclusive.

By order,
ERNEST L. BURTON,
Secretary.

5, Great Winchester Street,
London, E.C., Feb. 10, 1895.

NOTICE.

TO GAS ENGINEERS AND OTHERS.

MESSRS. CLAPHAM BROS., Limited, Keighley, Yorkshire, are no longer authorized to Manufacture my CONDENSER and WASHER-SCRUBBERS.

The above-named Gas Apparatus are erected and giving entire satisfaction at the following places: Neath, Lincoln, Sheffield, Ellesmere, Mountain Ash, Malden, Cullingworth, Montreal (Canada), Woodstock (South Africa), Cape Town (South Africa), &c.

These Appliances can now be obtained solely of the undersigned.

Winchester House, London, E.C. J. A. KELMAN.

NOTICE.

TO GAS ENGINEERS AND OTHERS.

CLAPHAM BROS., LIMITED, of Keighley, Yorks., beg to intimate that they are the SOLE MAKERS of LAYCOCK & CLAPHAM'S "ECLIPSE" WASHER-SCRUBBER, and that no person or persons beyond the Patentees and Makers have ever had any interest whatever in the Patent.

They are also the SOLE MAKERS of CLAPHAM'S PATENT IMPROVED "ECLIPSE" CONDENSER, as supplied to Bradford, Manchester, and other Gas-Works.

Orders and Inquiries promptly attended to. See advertisement in last week's JOURNAL, p. 292.

REPORTS OF GAS ASSOCIATIONS
— UNITED KINGDOM —
FOR
1894.
TWELFTH YEAR.

The Eleven previous Volumes (for 1883 to 1893) are still on Sale. Price 5s. 6d. each, post free.

Now Ready, Price 5s. 6d. each, Post Free,
THE COMPLETE REPORTS
OF PROCEEDINGS OF THE
DISTRICT ASSOCIATIONS of GAS MANAGERS FOR 1894.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

HARCOURT'S COLOUR TEST.

For Carbon Bisulphide, Sulphuretted Hydrogen, and Carbonic Acid in Coal Gas.

The Materials for the above Tests may be obtained from

Mr. S. E. MILLER, 115, Cowley Road, Oxford.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
B Lombard Street, NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

GAS-RETORTS. FIRE-BRICKS.
Société de Produits Refractaires
DE SAINT-GHISLAIN (BELGIUM).
LUMPS, TILES, FIRE-CEMENT, &c.
EXPORTATION *via* ANTWERP.
REGENERATIVE GAS-FURNACES—PRINCIPE DE BROUWER.

HOLMSIDE GAS COALS.
PRESENT DAILY PRODUCE OVER 4000 TONS.
LATEST ANALYSIS:—

Yield of Gas Per Ton. . 11,205 Cubic Feet.
Illuminating Power, 16 7/9 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.
PRESENT DAILY PRODUCE AVAILABLE, 2500 TONS.
RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton. . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar . . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COAL-FIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

HUNTER'S

OXIDE OF IRON.

JAMES HUNTER, MINER, AND SHIPPER OF
NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

11, BAY STREET, PORT GLASGOW.

Telegrams: "HUNTER, PORT GLASGOW."

Established 1872.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO.,
Central Plumbing Works, Town Hall Square,
BOLTON.

Practical Makers of all kinds of Saturators, and Specialists in every description of Lead Work required in connection with Sulphate Plants.

Special attention to Repairs.

Improved Lead-Burning Machines, Sulphate Bagging Machines, Copper Scoops, &c.

HIGHEST REFERENCES ON APPLICATION.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Bombay Gas Company, San Paulo Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER

HEATHCOTE GAS COAL.

Rich in Illuminating Power & Yield of Gas.

Above the average in Weight & Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR Co., Ld.,
CHESTERFIELD.

COKE BREAKERS.

C. R. Mather & Son, Engineers, Wellingborough

KENT'S THICK GAS COAL

RAISED AT
The Wharncliffe Woodmoor Colliery,
BARNSLEY.

Yield of Gas, nearly 12,000 *Cubic Feet per ton of Coal; and Illuminating Power, nearly* 17½ *Candles.*

The following is a complete ANALYSIS made by Mr. R. O. PATERSON, C.E., Gas-Works, Cheltenham:—

Specific Gravity (Water 1)	1·276
Weight of One Cubic Foot	79·700 lbs.

PROXIMATE ANALYSIS.

Moisture in Coal	2·68 per cent.
Volatile Matter	35·60 ,,
Fixed Carbon	58·80 ,,
Sulphur	0·96 ,,
Ash	1·96 ,,

COMMERCIAL ANALYSIS.

Gas per Ton of Coal	11,760 cub. feet.
Gas per Cubic Foot of Coal	418 ,,
Illuminating Power	17·44 candles.
Value of One Cubic Foot in Sperm	418 grains.
Value per Ton of Coal in Sperm	703 lbs.
Coke per Ton of Coal	1367 ,,
Coke	61·05 per cent.
Ash in Coke	3·21 ,,
Sulphur Eliminated with Volatile Products per Ton of Coal	9·4 lbs.
Sulphur in Coke per Ton of Coal	12 ,,
Ammoniacal Liquor per Ton of Coal	19·7 galls.
Tar per Ton of Coal	12·2 ,,

R. O. PATERSON, C.E.

Gas-Works, Cheltenham,
8th August, 1894.

For Price, &c., apply to
THE
Wharncliffe Woodmoor Colliery Co
LIMITED.
BARNSLEY.

COKE BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT.)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,
PARK STREET, SOUTHWARK, E.C.,
And at STROUD, GLOUCESTERSHIRE.

LONDONDERRY GAS COALS

FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.

Available output up to 5000 tons per da.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

THORNLEY GAS COALS

WORKED BY THE
WEARDALE IRON AND COAL COMPANY, Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.
Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The
WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13½ cwt.
Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**
The Coke was of excellent quality.
The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
London Office:
90, CANNON STREET, E.C.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yie'd of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

SIMMANCE'S PATENT EDUCTION VALVE

FOR ENTIRELY OBVIATING THE ILL-EFFECTS OF DOWN DRAUGHT UPON

GAS-FIRES, GAS-COOKERS, VENTILATING-LIGHTS, BATH WATER-HEATERS, &c.

This simple and effective contrivance has been before the public in a more expensive form for some years, but is now placed on the Market at prices which will render its adoption possible for Apparatus let on hire by Gas Companies.

Testimonials.

ISAAC CARR, Esq., Assoc.M.Inst.C.E., Widnes, says: "You will be glad to learn that the Eduction Valves made under your patent for preventing down draught, which were supplied to this Corporation in 1889 for the Public Library and Reading-Room, are working in a most satisfactory manner—in fact, quite as well as when first fixed. They are certainly the best things of the kind that have ever come under my notice."—*Dec.* 5, 1894.

W. R. HERRING, Esq., Corporation Gas-Works, Huddersfield, says: "In reply to your inquiry, I have pleasure to inform you that your Eduction Valves for Gas-Fires work admirably, and entirely prevent down draught, whilst allowing the products of combustion to escape."—*Feb.* 6, 1895. (Repeat order enclosed.)

JOHN YOUNG, Esq., British Gaslight Company, Etruria, says: "I beg to inform you that your Eduction Valves for Gas-Fires have proved quite satisfactory."—*Feb.* 4, 1895. (Repeat order enclosed.)

J. H. TROUGHTON, Esq., Newmarket Gas Company, says: "The Eduction Valves are very effective for Gas-Fires, and answer admirably on chimneys subject to down draughts." (Order enclosed.)

NOTICE TO GAS COMPANIES ALREADY USING THESE VALVES.—The 2-inch size is no longer made; 2½-inch being now the smallest. The Ventilator is made up to 24-inch shaft, for Sun-Burners.

JOHN F. SIMMANCE,

Temporary Office: 58G, HATTON GARDEN, E.C.

ALEXANDER CAMERON,

CANNEL & GAS COAL MERCHANT,

48, WEST REGENT STREET

GLASGOW.

LABORLESS WORK In 1895.

ENGINEERS AND MANAGERS

Making preparations to adopt

SELF-ACTING SYSTEMS OF CARBONIZING In 1895,

are cordially invited to call and inspect our latest Designs of Automatic Coal and Coke Handling and Charging Machinery.

We send skilled Draughtsmen to get Particulars for Detail Plans.

Address:—

NEW CONVEYOR CO., LTD.,

3 & 4, Lime Street Square, London, E.C.

PIPES, 2-in. to 8-in. **PIPES,** 2-in. to 8-in. **PIPES.**

MONIER-WILLIAMS & Co.

IRONFOUNDERS,

MIDDLESBROUGH.

T. B. KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL

ENGLISH & SCOTCH CANNELS.

REAL SILKSTONE GAS COAL

ANALYSIS AND PRICES ON APPLICATION.

T. B. KITTEL, SHEFFIELD.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

Shipments Promptly and Carefully Executed.

ALFRED WILLIAMS & CO.

[MATTHEW MILDRED]

70, 71, 72, & 73, BANKSIDE,

SOUTHWARK, S.E.

UNIVERSAL PROVIDERS

FOR

GAS, WATER, & SEWAGE WORKS.

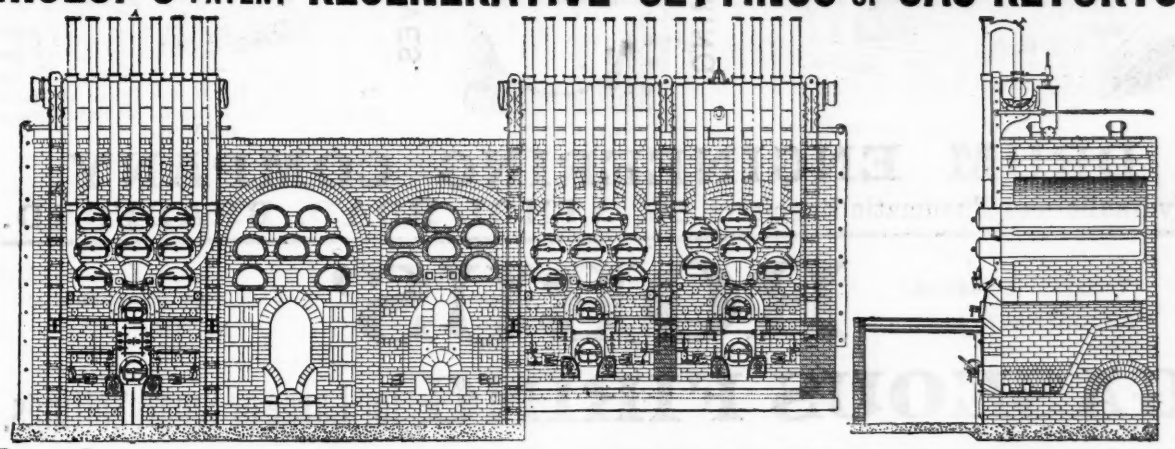
ENGINEERS & CONTRACTORS

For the Erection of Complete Gas and Water Works, and for Renewals and Extensions of every description.

PLANS & ESTIMATES ON APPLICATION.

MAIN LAYING AND RETORT SETTING.

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS, CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Specifications are furnished for the complete erection of Ovens, with or without Retort and Bench Mountings; or complete erection undertaken if required, and carried out by specially Trained Workmen.

Further particulars may be obtained on application to the Patentee's Agents: C. M. HAMILTON, 5, Stuart Street, Shawlands, Glasgow; J. E. FISHER, Stourbridge; JOHN WALSH & SONS, Retort Builders, Halifax, Yorkshire; RICHARD TURNER, Retort Builder, Denton, Lancashire; and from the Principal Agent, R. F. HISLOP (son of Patentee), Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non* TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

SPENT LIMES NO LONGER WASTE PRODUCTS

Under G. R. HISLOP'S Patents, all Spent Limes are most effectually, economically, and continuously recovered at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it.

Descriptive Pamphlets and Terms from Agents as above.

MOBBERLEY & PERRY
STOURBRIDGE.

Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c., &c.

EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.

Contractors for the erection of Retort-Benches complete.

London Agents:

BALE & HARDY, Gas Engineers and Contractors, BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C.

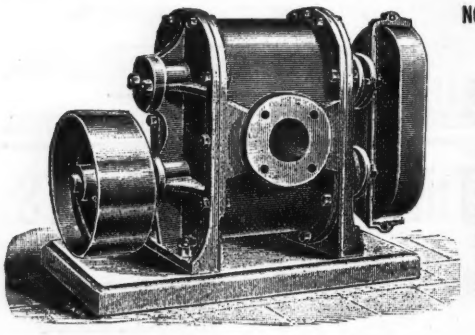
JOHNSON'S PATENT

DRUM PUMP AND GAS EXHAUSTER.

The Pump of the future for quickly and economically moving large bodies of Water, Semi-Fluids, &c.

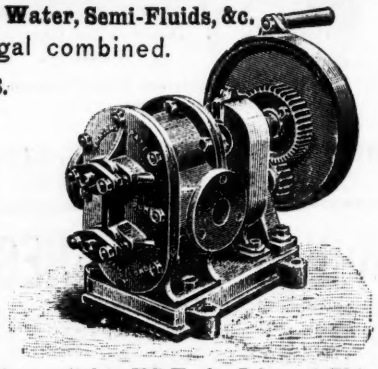
The force of the Piston Pump with the capacity of the Centrifugal combined.

NO SLIDES OR FRICTIONAL WORKING PARTS.



NO PRIMING.

NO VALVES.



As supplied to H.R.H. the Prince of Wales for Pumping Gas Liquor at his Sandringham Gas-Works.

DRUM ENGINEERING COMPANY,

Hydraulic and Pneumatic Engineers, **55, ATHOL ROAD, BRADFORD.**

Telegraphic Address: "ROBUSTNESS, London."

ROBUS'

Exchange Telephone No. 1758.

GASEOUS FIRING for Large or Small Settings.

INCLINED RETORT-SETTINGS, with or without Gaseous Firing.

RETORT-SETTINGS of exceptional Merit for Works on Wet Soils.

GASHOLDER TANKS

AND GAS AND WATER WORK, INCLUDING MAIN LAYING.

CONTRACTS Entered into for Retort Work of every kind, and all descriptions of Gas Apparatus. Guarantees given for the efficiency of our Work.

Plans, Specifications, and Estimates, with every Particular.

J. & H. ROBUS, Gas and Water Contracting Engineers, 20, BUCKLERSBURY, LONDON, E.C.

WILLEY & CO.

GAS ENGINEERS & CONTRACTORS,

Central Works: Commercial Road, EXETER;

Meter Works: James Street, EXETER.

Telegraphic Address: "WILLEY, EXETER." Telephone No. 132.

Edison-Bell Phonograph Used.

Metropolitan Agent: CAPTAIN ACLAND, M.Inst.M.E., Assoc.M.Inst.C.E., DOCK HOUSE, BILLITER STREET, LONDON.

Manufacturers of every Requisite for Gas-Works.

Specialities: GASHOLDERS, GAS-METERS, GAS-FITTINGS.

WILLEY AND CO. beg to announce that they have recently acquired the Sole Right and Proprietorship of the

"SIMPSON"

Automatic Penny-in-the-Slot Meter

(By Royal Letters Patent).

An application of the "Vernier Principle," ensuring Mathematical Accuracy of Registration, combining all the latest Scientific Improvements

PRICE INSTANTLY, SIMPLY, & READILY ADJUSTED *IN SITU*, BY SINGLE FEET OR HALF FEET, WITHOUT CHANGE OF WHEELS.

STRENGTH, DURABILITY, & MINIMUM SIZE.

AMPLE WARNING & GRADUAL EXTINCTION.

BASE OR MISTAKEN COIN DETECTED & RETURNED.

Terms on Application.

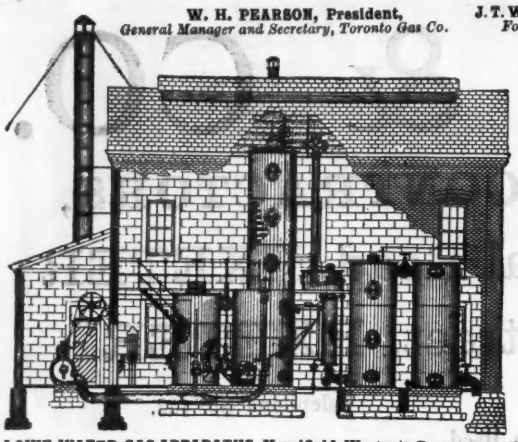
NEW CATALOGUE OF GAS-FITTINGS of novel and registered designs, with Special Quotations to Gas Companies, now in the Press for early circulation.

Agents for the "MAXIM PATENT CARBURETTOR" New Process of Gas Enrichment by Carburine.

W. H. PEARSON, President,
General Manager and Secretary, Toronto Gas Co.

J. T. WESTCOTT, M.E., General Manager & Treasurer,
Formerly Engineer for the United Gas Improvement Company, U.S.A.

L. L. MERRIFIELD, Chief Engineer,
Formerly Engineer for the United Gas Improvement Company, U.S.A.



LOWE WATER-GAS APPARATUS, Merrifield-Westcott-Pearson Setting.

THE
Economical Gas Apparatus Construction Co., Ld.
ENGINEERS AND BUILDERS
OF THE
IMPROVED LOWE
CARBURETTED WATER-GAS PLANT

Designed to give the greatest efficiency when using any kind of Oil, Gas-House Coke, Oven Coke, or Anthracite Coal.

MR. WESTCOTT MAY BE CONSULTED AT THE
LONDON OFFICES: SUFFOLK HOUSE, LAURENCE POUNTNEY HILL, E.C.
Canada and U.S.A. Offices: TORONTO.

Telegraphic Addresses: "COATESLEE, LONDON." "ECONWEST, TORONTO."

PATENT RIVET COMPANY, LTD., SMETHWICK, NEAR BIRMINGHAM.

Established 1843.
TELEGRAMS: "PRIVET BIRMINGHAM."
MANUFACTURERS OF

BOLTS & NUTS
FOR
PIPE JOINTS,
FLANGE JOINTS,
RETORT MOUTH-PIECES,
SCRUBBERS,
CONDENSERS,
PURIFIERS,
SIEVES, TANKS,
ENGINES,
BOILERS,
&c., &c.

RIVETS
FOR
GASHOLDERS,
BOILERS,
GIRDERS,
TANKS,
COVERS,
&c., &c.; ALSO
SET SCREWS,
WASHERS,
SPIKES,
AND
FISH-PLATE BOLTS.

Sole Manufacturers of the "PERFECT" Patent LOCK-NUT and WASHER.

THE WHESSOE FOUNDRY CO., LTD., DARLINGTON.

Established 1790.

MANUFACTURERS OF EVERY DESCRIPTION OF GAS PLANT,
FROM
RETORTS
TO
GASHOLDERS

FOR WHICH THEY HAVE THE NEWEST AND MOST MODERN MACHINERY.

GASHOLDERS CAN BE MADE OF ANY DIAMETER AND PUT TOGETHER AT THE WORKS.

Holders having a capacity of **8,000,000** Cubic Feet have been made and erected; the largest one being 181 feet diameter by 136 feet 9 inches deep. Riveted entirely with ⅞-inch diameter Hot Rivets.

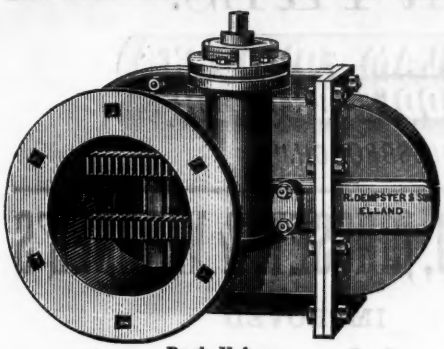
WE ERECT GASHOLDERS EITHER WITH OR WITHOUT FRAMING.

NO ROYALTIES TO PAY FOR PATENTS.

SOLE MAKERS OF
COATES' IMPROVED PATENT FURNACE DOOR PROTECTOR
Which has been approved and adopted by the Gas Authorities at
SALFORD, MANCHESTER, BIRKENHEAD, STOCKTON, NEWCASTLE, DARLINGTON, &c.

Telegraphic Addresses: "WHESSOE, DARLINGTON." "WHESSOE, LONDON." | T. COATES, MANAGING DIRECTOR. | WORKS: DARLINGTON. LONDON OFFICE: 28, QUEEN STREET, E.C.

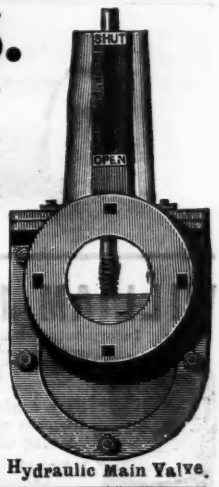
DEMPSTER'S VALVES.



Rack Valves.

Are of strong and substantial make.
Have Machine-Faced Flanges.
Have Mild Steel Spindles.
Are Tested before leaving Works.

All sizes of Rack, Screw, Double-Face, Disc, and Hydraulic Main Valves generally in Stock.



Hydraulic Main Valve.

ELLAND, YORKS.

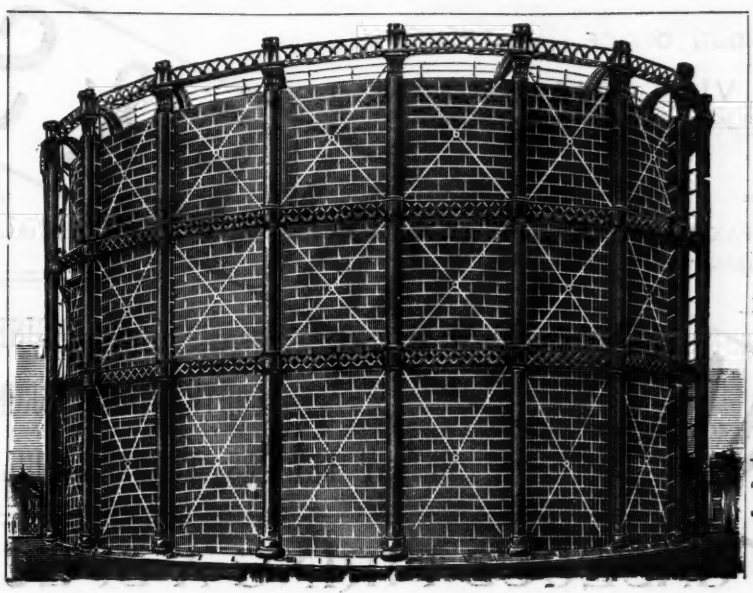
CLAYTON SON & Co., LTD.,
MAKERS OF LARGEST GASHOLDER IN LEEDS WORLD
ALSO THE LARGEST METAL TANK IN THE WORLD
See Advertisement last week, also next week
MAKERS OF RETORT-LIDS OF ALL FORMS & SHAPES BY SPECIAL HYDRAULIC MACHINERY

THE HORSELEY CO., LTD., TIPTON, STAFFORDSHIRE.

MAKERS OF **GASHOLDERS & GAS PLANT.**

PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES, PIPES, LAMP PILLARS, RETORT-FITTINGS, ETC.

ALSO ALL KINDS OF STRUCTURAL IRON AND STEEL WORK, BRIDGES, ROOFS, PIERS, ETC.



WORKS AND HEAD OFFICE:
TIPTON,
STAFFORDSHIRE.

LONDON OFFICE:
11, VICTORIA ST.,
WESTMINSTER.

TELEGRAPHIC ADDRESSES:
"HORSELEY, TIPTON."
"GALILEO, LONDON."

GAS AND WATER PIPES.

Telegraphic Address: "RITCHIE MIDDLESBROUGH."

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
CXC	"JACKSON"	BECK & Co.,
MARK.	CLAY CROSS.	130, GT. SUFFOLK ST., S.E.

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

OVENDEN, HALIFAX.

LONDON OFFICE

60, QUEEN VICTORIA ST., E.C.

Telegraphic Addresses:
"DRAKESON, HALIFAX."
"ECLAIRAGE, LONDON."

Telephone: No. 43.
HALIFAX EXCHANGE.

JONAS DRAKE & SON

GAS ENGINEERS,

CONTRACTORS, IRONFOUNDERS,

RETORT SETTERS, FURNACE BUILDERS, &c., &c.

GASEOUS FIRING A SPECIALTY.

THE DAVIS GAS-STOVE COMPANY, LIMITED

LONDON, S.E.,

MANUFACTURERS OF LARGE

Gas and Steam Cooking Apparatus

SUITABLE FOR

UNIONS, ASYLUMS, HOSPITALS, CLUBS, RESTAURANTS, &c.

ALSO

MAKERS OF THE POPULAR

"METROPOLITAN"

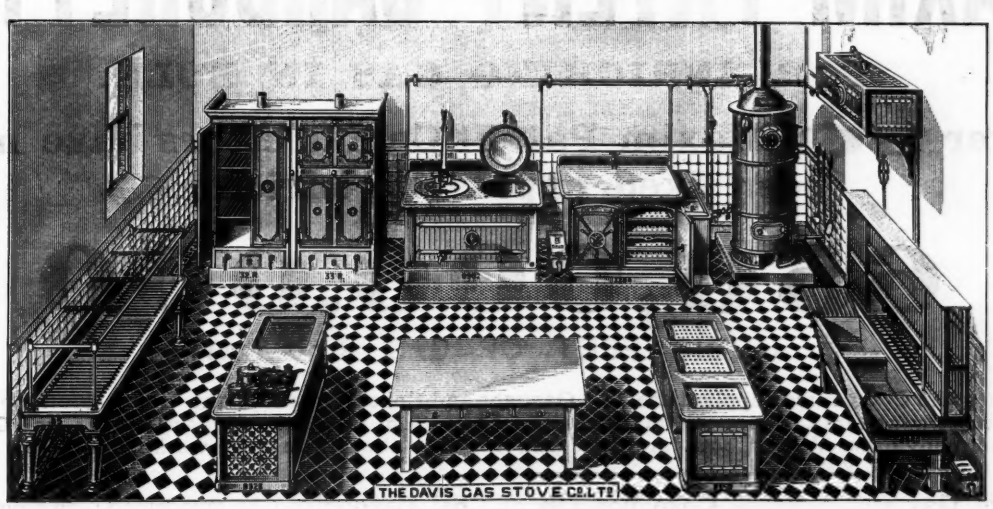
SERIES OF

Enamelled Economical Family Gas Kitcheners

(55,000 in use in London alone), which are admitted to be the most ECONOMICAL Gas-Stoves IN POINT OF GAS CONSUMPTION of any in the Market.

MANUFACTURERS OF ALL CLASSES OF

Hot Water or Steam Heating & Circulating Apparatus by Gas or Coal.



Design of MODEL KITCHEN, consisting of Vertical Cross-Tube Steam-Boiler, Steam Cooking-Chest, Double Jacketed Steam Boiling-Pans, Large Gas-Roaster in three Compartments, Gas Hot-Plate and Plate-Rack, Steam Hot-Closet with Carving-Table, Steam Hot-Closet with Bain Marie, Improved Washing-up Sink with Plate-Rack and Draining-Boards, Hot-Water Tank, the whole calculated to do the entire Cooking necessary for an Establishment providing Meals for from 800 to 1000 people.

Write for Lists of Establishments already supplied.

ALEX. C. HUMPHREYS, M.E. TELEGRAPHIC ADDRESS: "EPISTOLARY, LONDON." A. G. GLASGOW, M.E.

HUMPHREYS & GLASGOW,

Contracting Engineers for

CARBURETTED WATER GAS PLANT,

9, Victoria Street, London, S.W.

United States Office:
64, Broadway,
New York.

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
Established 1860.

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.
MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.
ESTABLISHED 1836.

ARROL-FOULIS
Patent Automatic Machinery
FOR
DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,
GLASGOW.

See Illustrated Advertisement, p. II. Centre of JOURNAL for Feb. 5.

THE

MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

Over 50 Maxim Patent Carburettors have now been fixed, capable of enriching

650,000,000

CUBIC FEET OF GAS PER DAY.

Among the Companies supplied are The Gaslight and Coke Company, the South Metropolitan Gas Company, Birmingham Corporation, Manchester Corporation, Rochdale Corporation, Bristol Gas Company, and many other Works, both large and small, where they have been working in some instances for the past **FOUR YEARS.**

More Gas and saleable Coke per ton of Coal Carbonized is produced; saving Capital, Labour, Fuel, Wear and Tear, &c.

The Enrichment is **INSTANTANEOUS** and **PERMANENT.**

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

FOR PRICES AND FULL PARTICULARS, APPLY TO

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,
18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

Dealers in Carburine and all other Naphthas for the Enrichment of Gas.

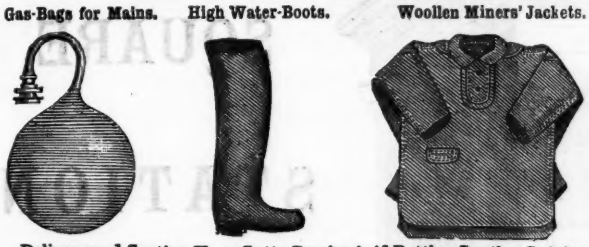
STOURBRIDGE RETORTS AND FIRE-BRICKS.

BEST QUALITY.

KING BROTHERS, STOURBRIDGE.

[See Illustrated Advertisement, Feb. 5, p. 285.]

Gas-Bags for Mains. High Water-Boots. Woollen Miners' Jackets.



Delivery and Suction Hose, Gutta-Percha Acid Bottles, Leather Driving Bands, Woven Canvas Hose for Fire-Engines, Wedge and Square Gas-Bags, Air and Water Beds for Invalids, Oil Tarpauling Coats, Trousers, Hats, &c., Squeegees for cleansing Pavements, &c., Billiard and Bagatelle Cush, Tricycle Tyres, Leather Hose, Cotton Waste, Engine Cloths, Oils, &c., India-rubber Waterproof Garments for Walking, Driving, or Sporting Wear, Diving and Wading Dresses, Printers' Blankets, Iron Wheels and Rollers covered with India-rubber. Stokers' Gloves, 14s. 6d. per dozen.

Write for Price List to

THOMAS BUGDEN, Manufacturer,
71, GOSWELL ROAD, LONDON, E.C.

PETTIGREW'S PATENT

Sulphate of Ammonia Plant

ON THE CONTINUOUS SYSTEM

Is the newest in the Market, and is the outcome of practical experience in Sulphate Making.

Old Systems easily and cheaply converted.

ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.

Write for Particulars, Testimonials, and References to

GEO. PETTIGREW & Co.,
GAS AND CHEMICAL ENGINEERS,
MIDDLESBROUGH-ON-TEES.

BEST & LLOYD

MAKERS OF BIRMINGHAM.

THE

PATENT "SURPRISE" PENDANT,

WITH PATENT SHADE.

The ONLY GAS-PENDANT suitable for Domestic Lighting; a room 18 ft. by 14 ft. being beautifully illuminated with one Incandescent Burner.

Extract from the JOURNAL OF GAS LIGHTING, Jan. 8, 1895.

"IN CONJUNCTION WITH

THE INCANDESCENT GAS-LIGHT,

it quite **supersedes** the familiar three-light pendant. We are able to bear witness to the **convenience** of the New Pendant."

STEEL SCOOPS FOR RETORT CHARGING.

Scoops supplied with or without handles, and of any dimensions or shape required.

HENRY SYKES, Engineer,
66, BANKSIDE, LONDON, S.E.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS.

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS.

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

The Climax of Regenerative Gas Lighting!!

THE

"VERTMARCHE"

A 280-CANDLE POWER

PLAIN IRON LAMP,

CLASS A— **55/-**

LIGHT for LIGHT less than half the price of any other Regenerative Lamp.

Manufactured in England.

HENRY GREENE & SONS,

153 & 155, CANNON STREET,
LONDON BRIDGE, E.C.

PARTICULARS AND PRICES FREE. AGENTS WANTED.

J. & W. HORTON

ETNA WORKS,

SMETHWICK,

NEAR BIRMINGHAM

(Established 50 Years),

PATENTEES

AND

MANUFACTURERS

OF

IMPROVED GASHOLDERS AND BOILERS

and Manufacturers of every description of

Gas Apparatus,

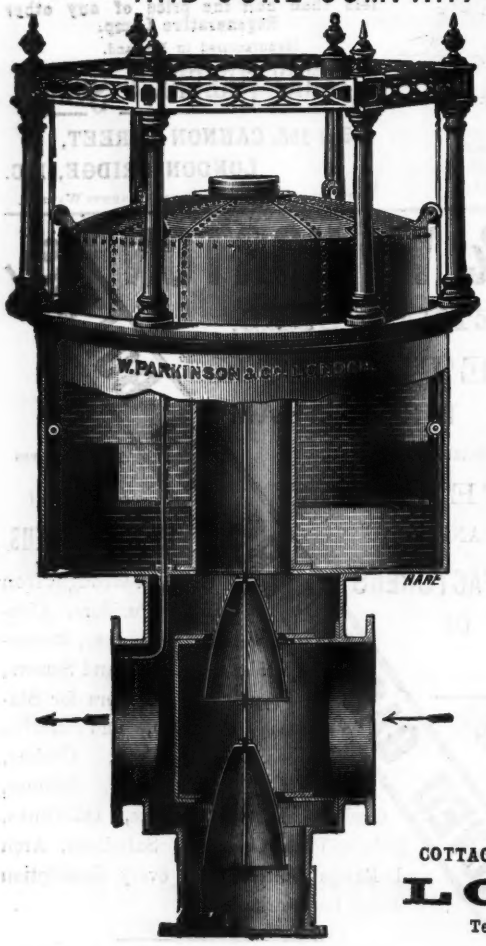
Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

Drawings, Specifications, and Estimates supplied.

W. PARKINSON & CO.

SQUARE STATION METERS.

All the Meters (which number 14) at the Beckton Station of THE GASLIGHT AND COKE COMPANY have been erected by the above Firm.



PARKINSON'S PATENT EQUILIBRIUM GOVERNORS.

A very large number are now at work; and all Engineers who have adopted them speak in unqualified terms of their great efficiency.

COUNTERBALANCE or AIR VESSEL, as desired.
TWO, FOUR, or SIX COLUMNS and GIRDERS.
WEIGHTS or WATER PRESSURE.

COTTAGE LANE WORKS, CITY ROAD,
LONDON.
Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegraphic Address: "GAS-METERS."

[See also Advt. p. 302.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Feb. 12, 1895.